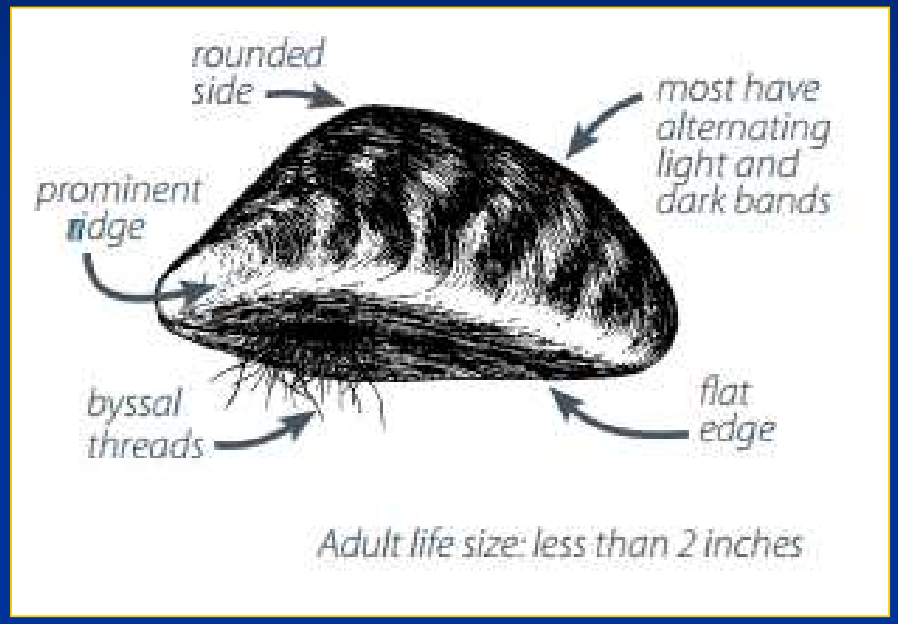
Zebra Mussel Monitoring
&
Aquatic Nuisance Species

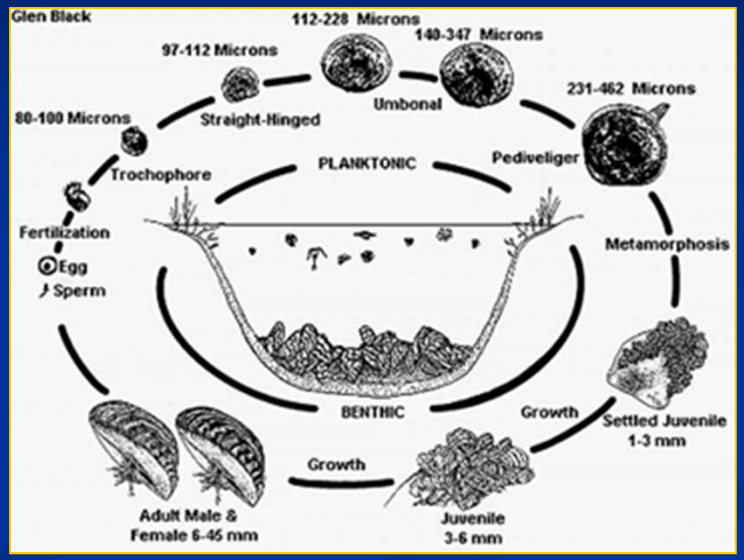
WHAT ARE ZEBRA MUSSELS?



- Triangular-shaped with zebra-like striping
- Cousins to the clams
- ¼ to 1 inch in size

Biology & Life Cycle

- External fertilization
- ~40,000 eggs in a reproductive cycle, **1 million** per spawning season
- Larvae emerge after 5 days, free swimming for a month, attach to substrate w/ byssus
- Life-span 3–9 years, sexually mature at 8–9 mm



WHY ARE ZEBRA MUSSELS A PROBLEM?

- Alter food chain

- Kill Native Mussels

WHY ARE ZEBRA MUSSELS A PROBLEM?

- Foul water intakes
- Damage engines

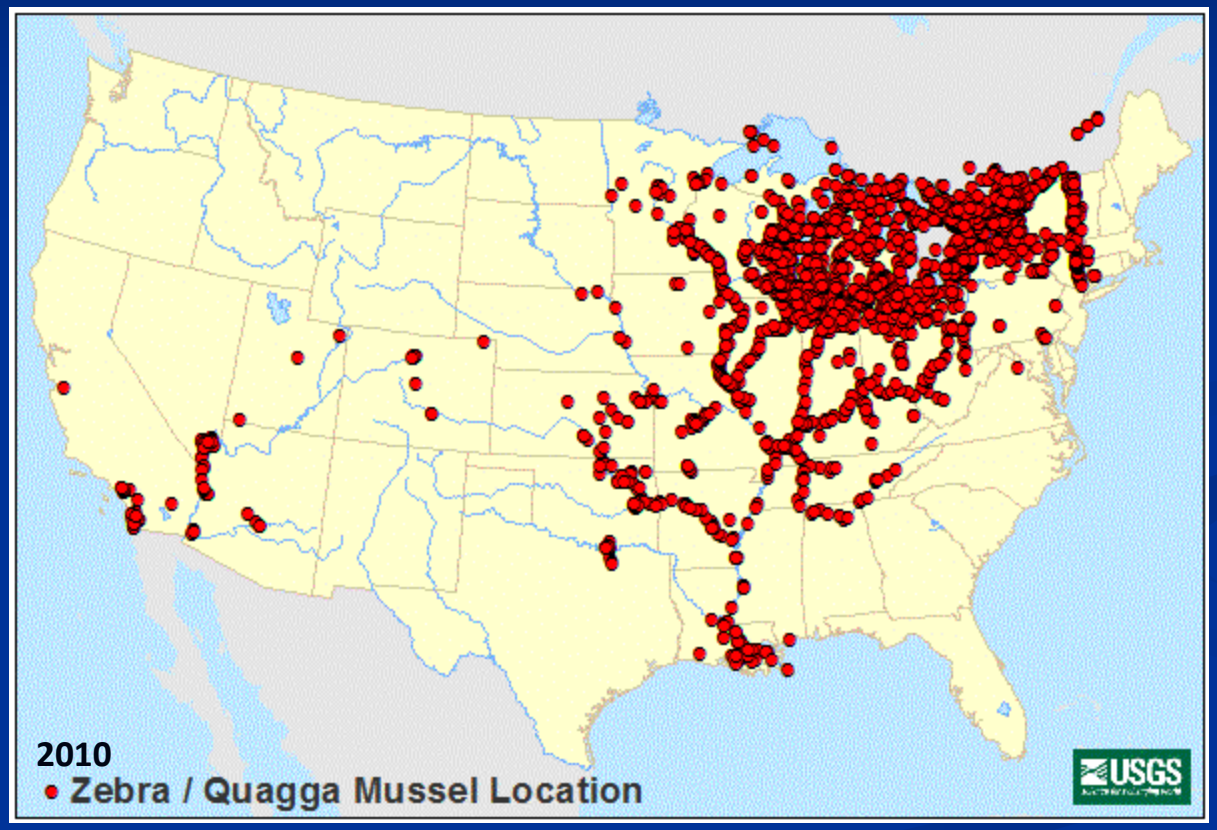
Annual cost: $2 BILLION !

Where did Zebra Mussels Come From?

- Originally from the Black, Caspian and Aral Seas in Eurasia

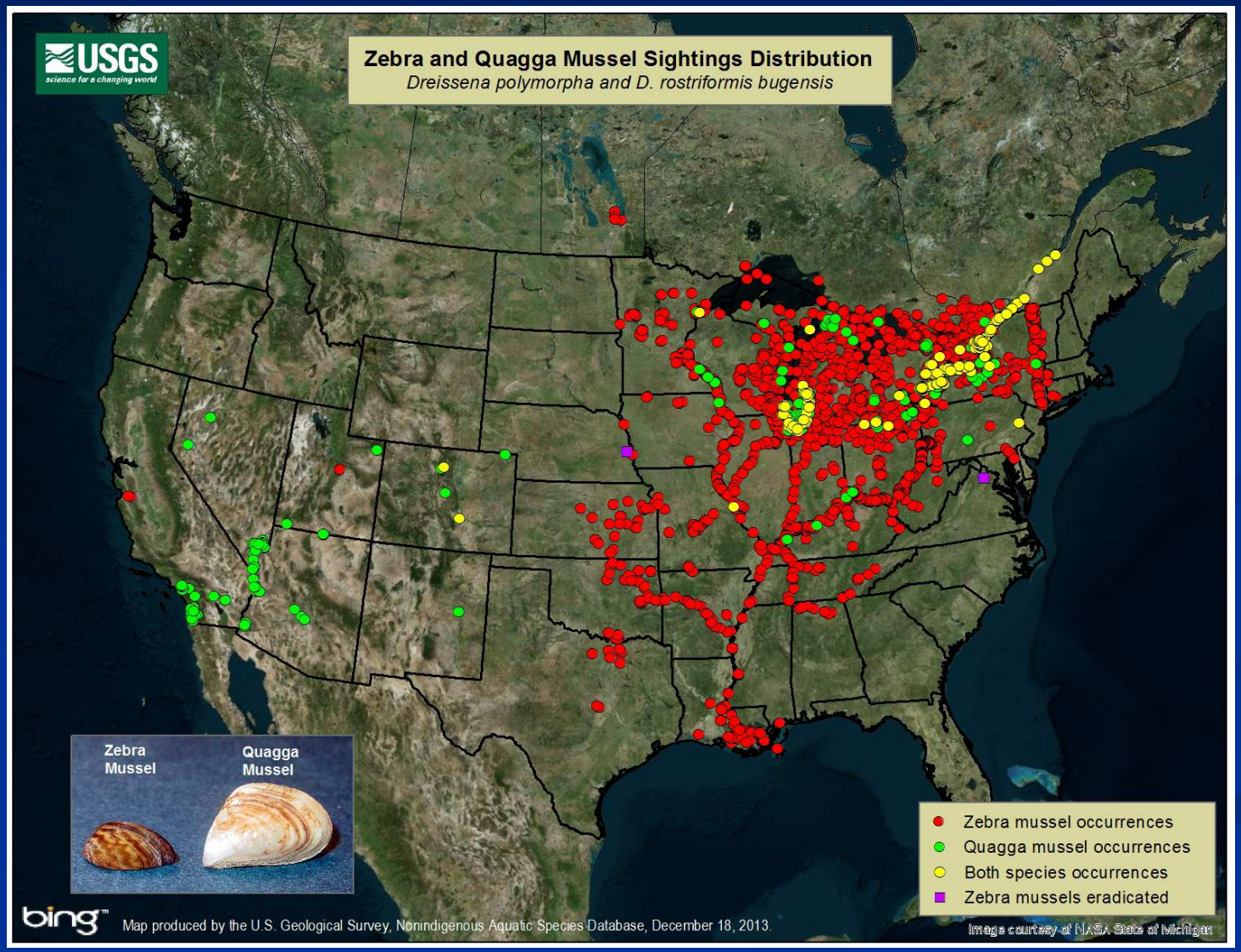
- Introduced into Lake St. Clair near Detroit, Michigan, by ballast water in the mid-1980s

The spread of zebra mussels



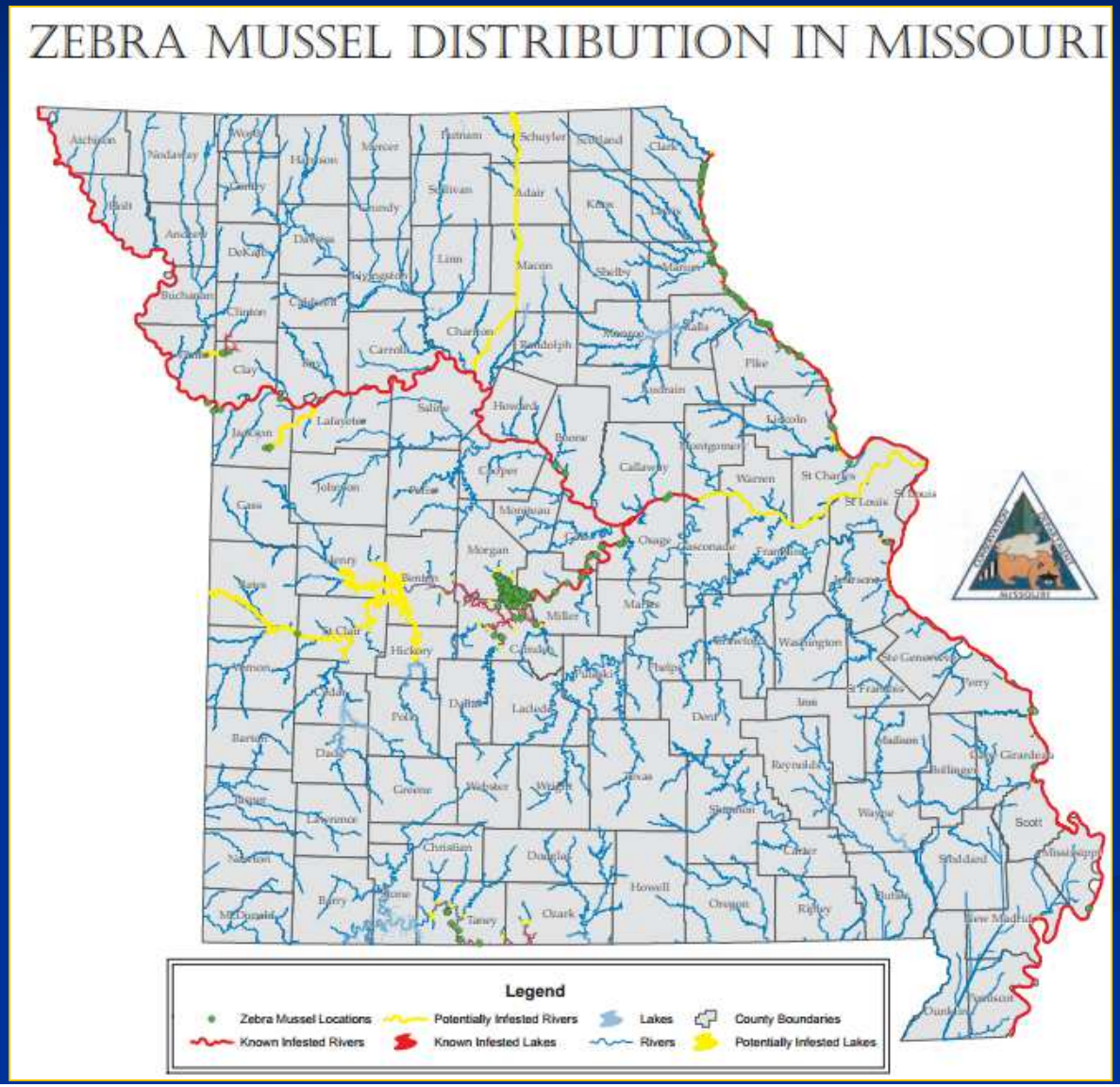
Source: http://fl.biology.usgs.gov/Nonindigenous_Species/ZM_Progression/zm_progression.html

CURRENT N.A. DISTRIBUTION



Missouri Distribution

www.mdc.mo.gov/nathis/exotic/zebra



Last updated:
April 2013

Missouri Distribution

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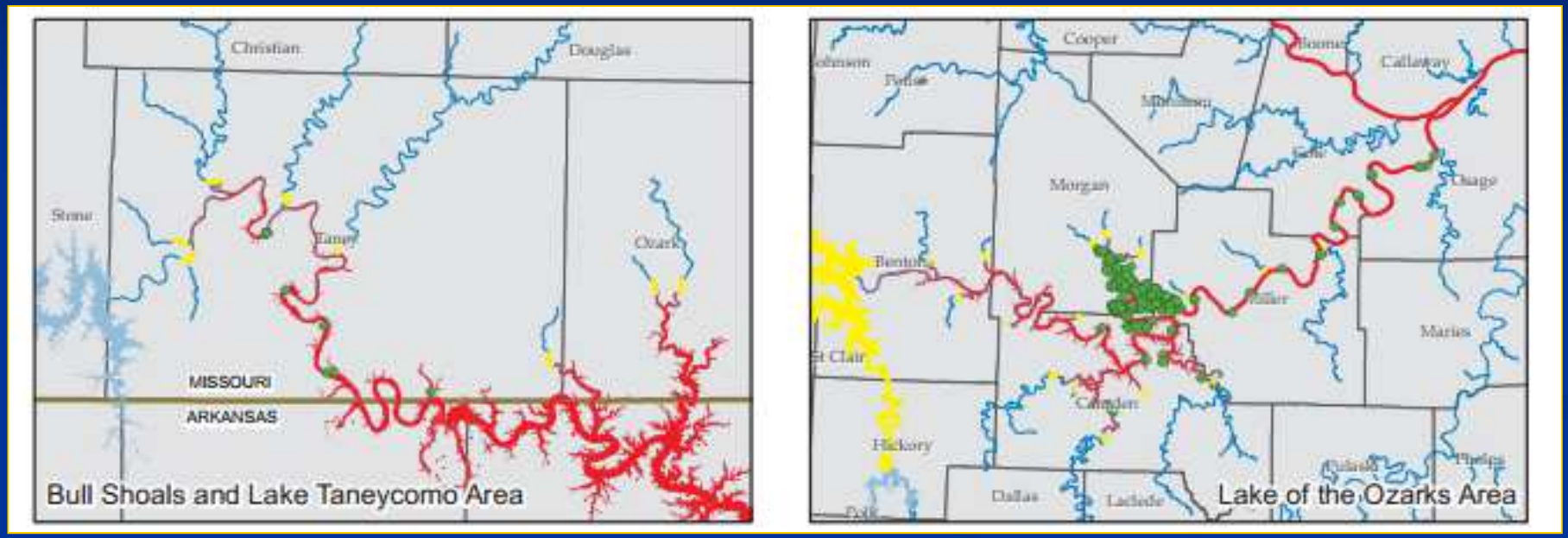
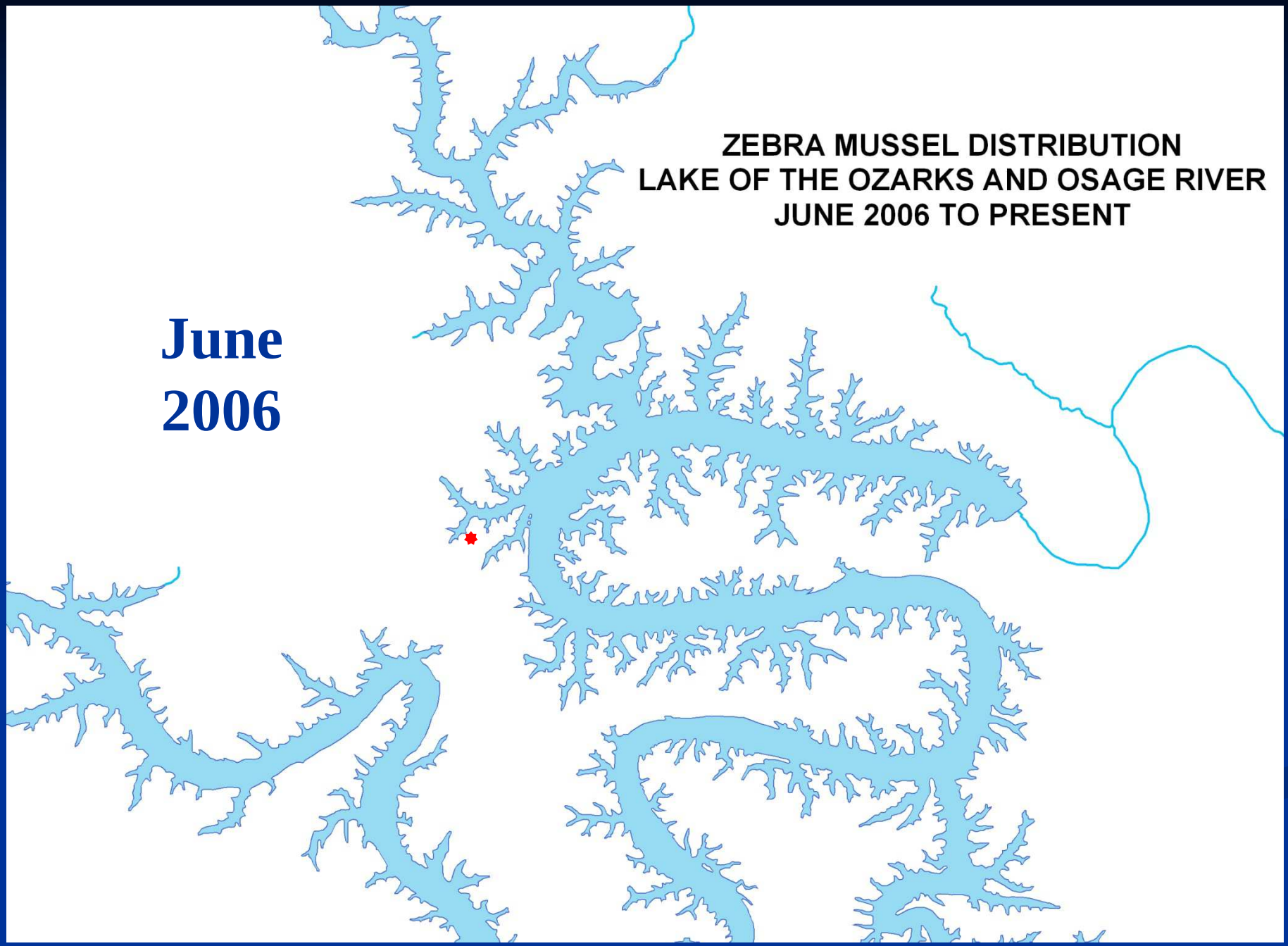
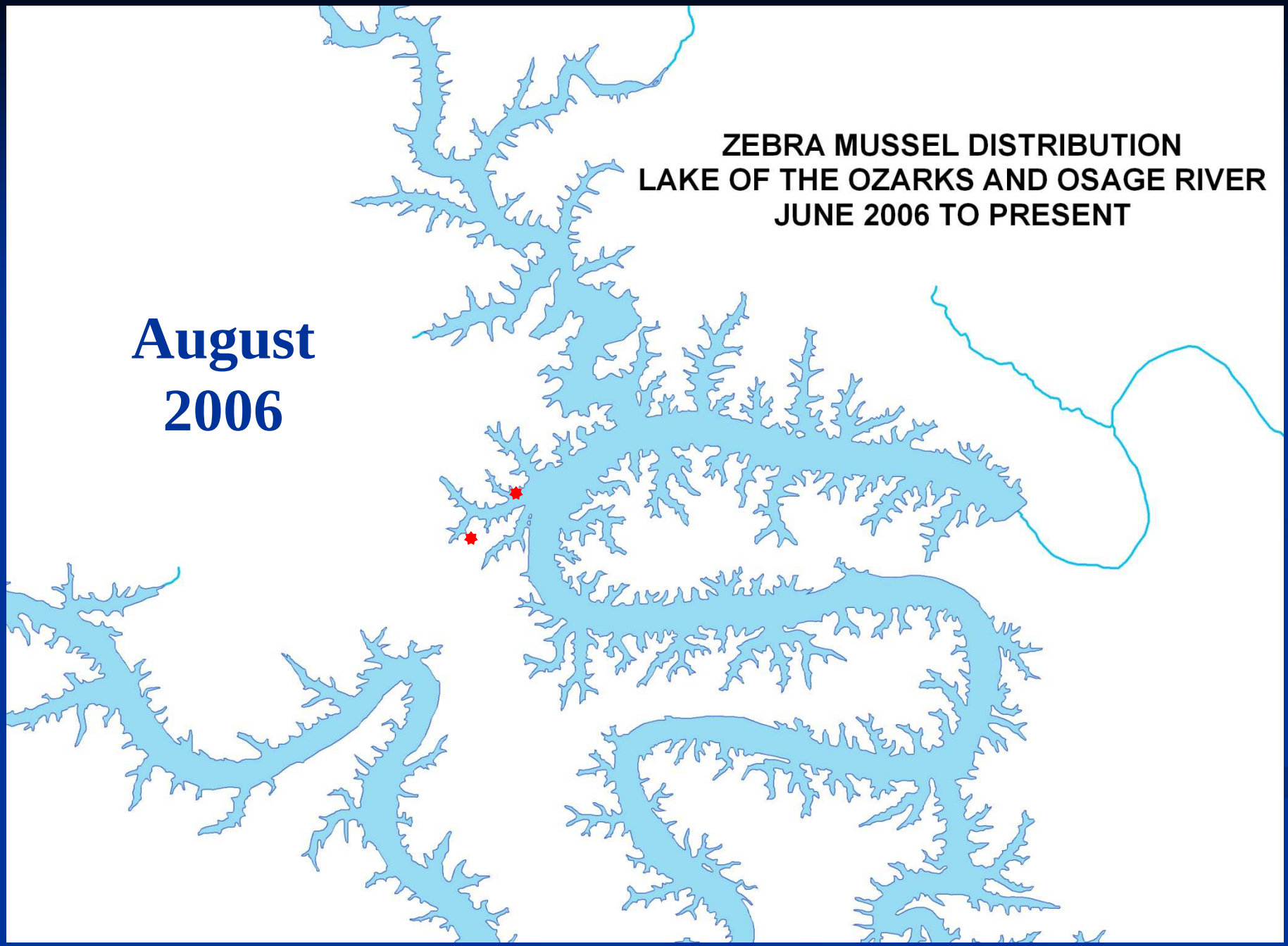
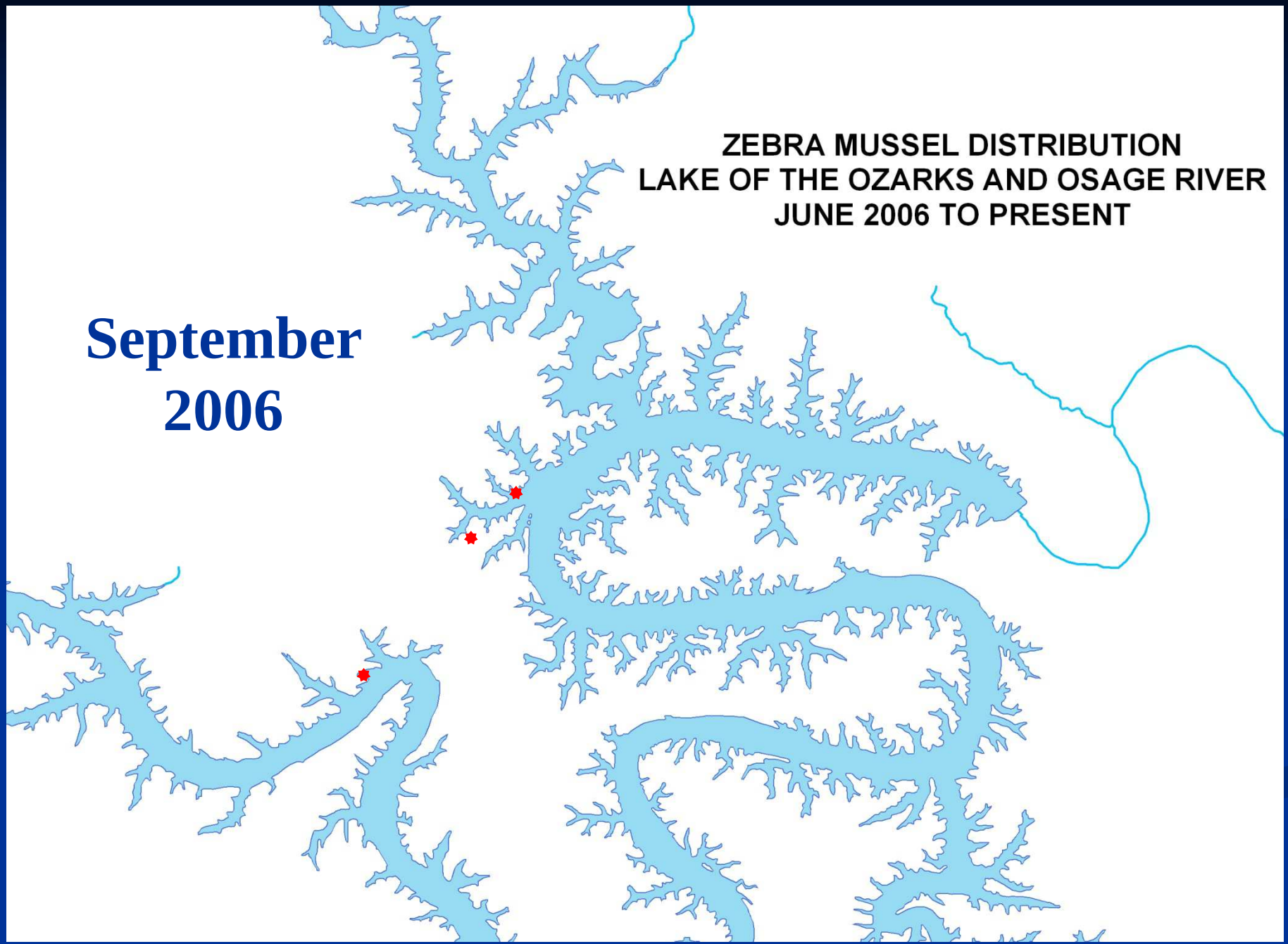


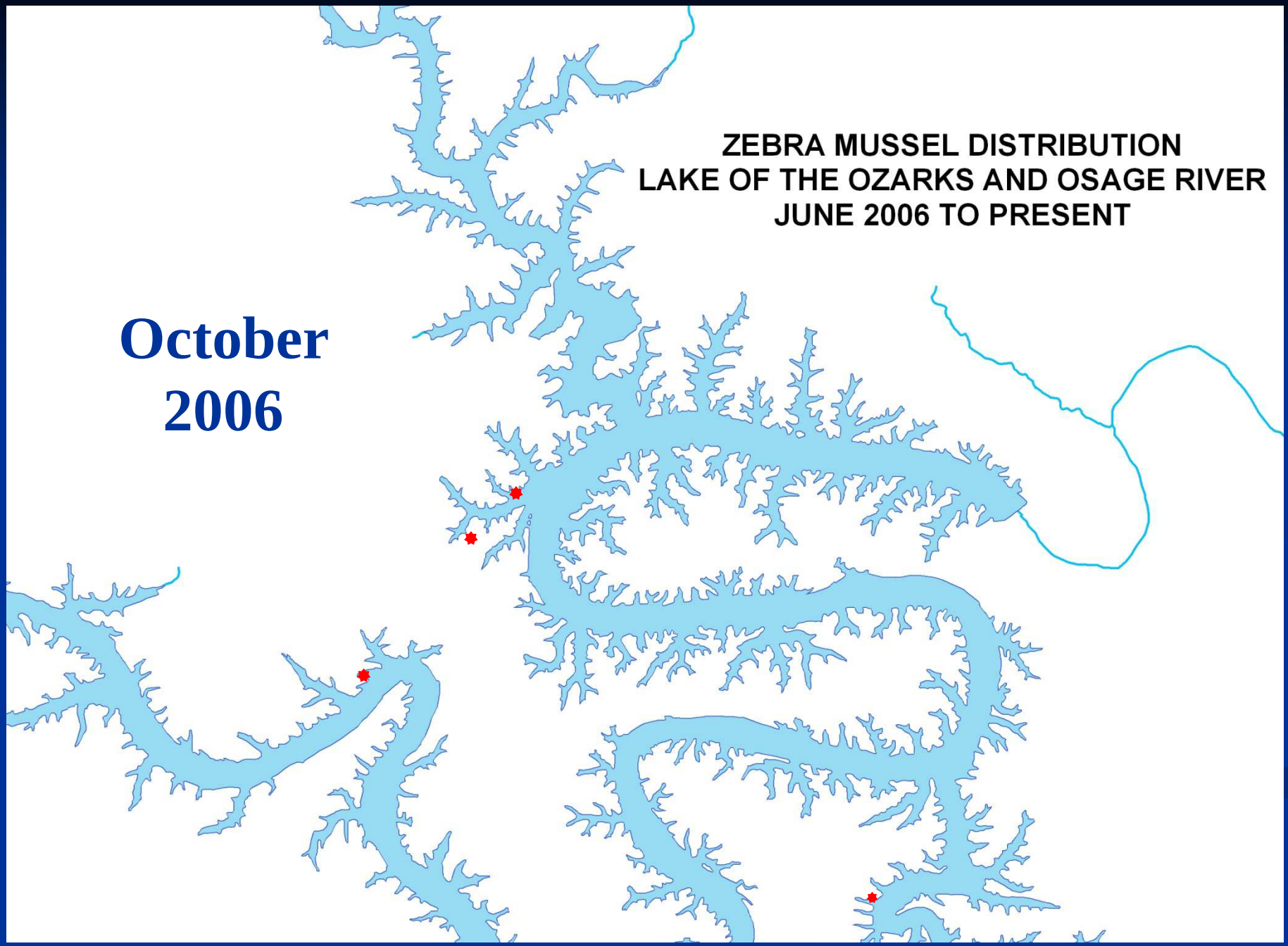
Last updated: April 2013

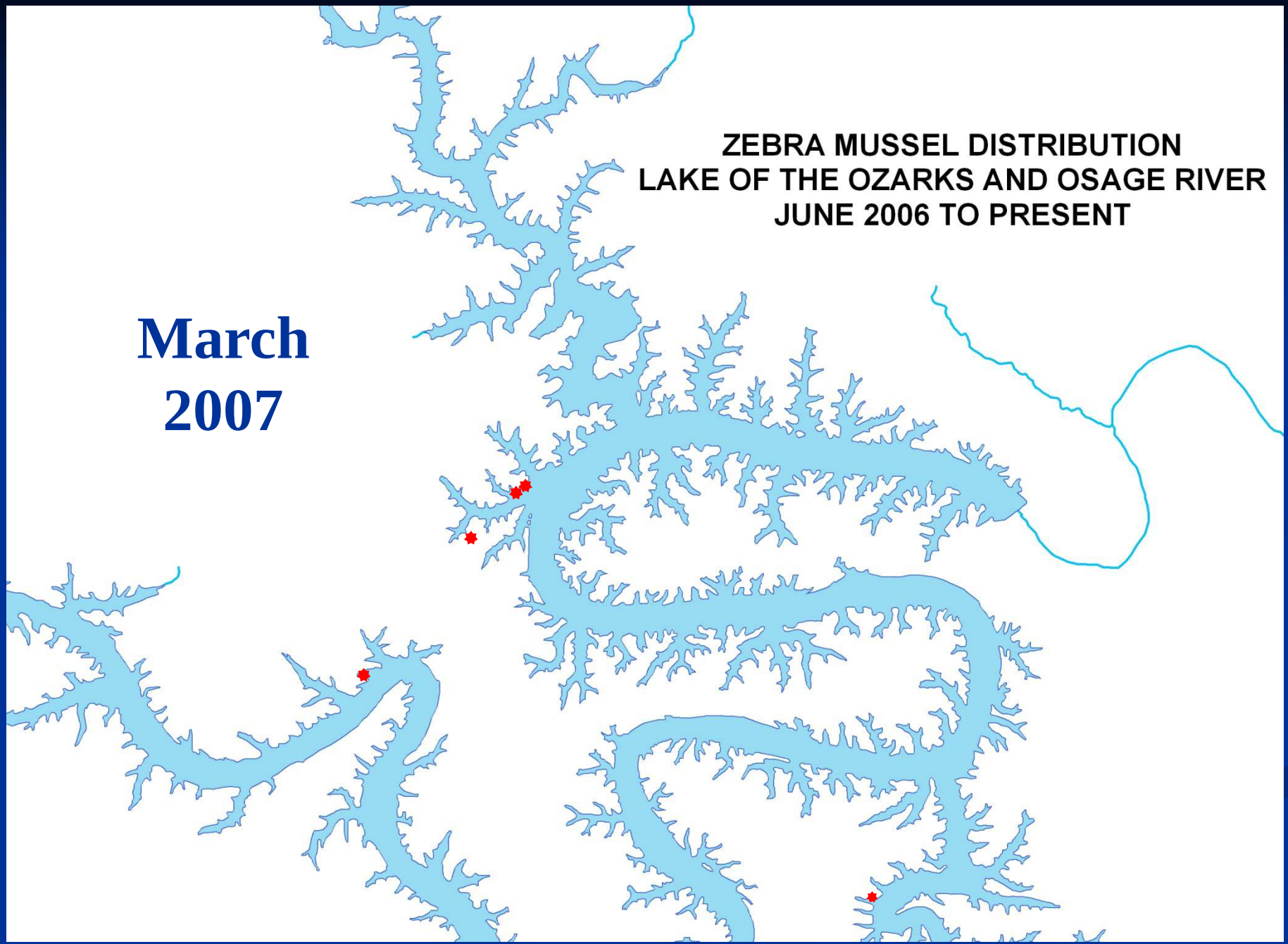
For more info contact the MDC Invasive Species Coordinator at 573/751-4115

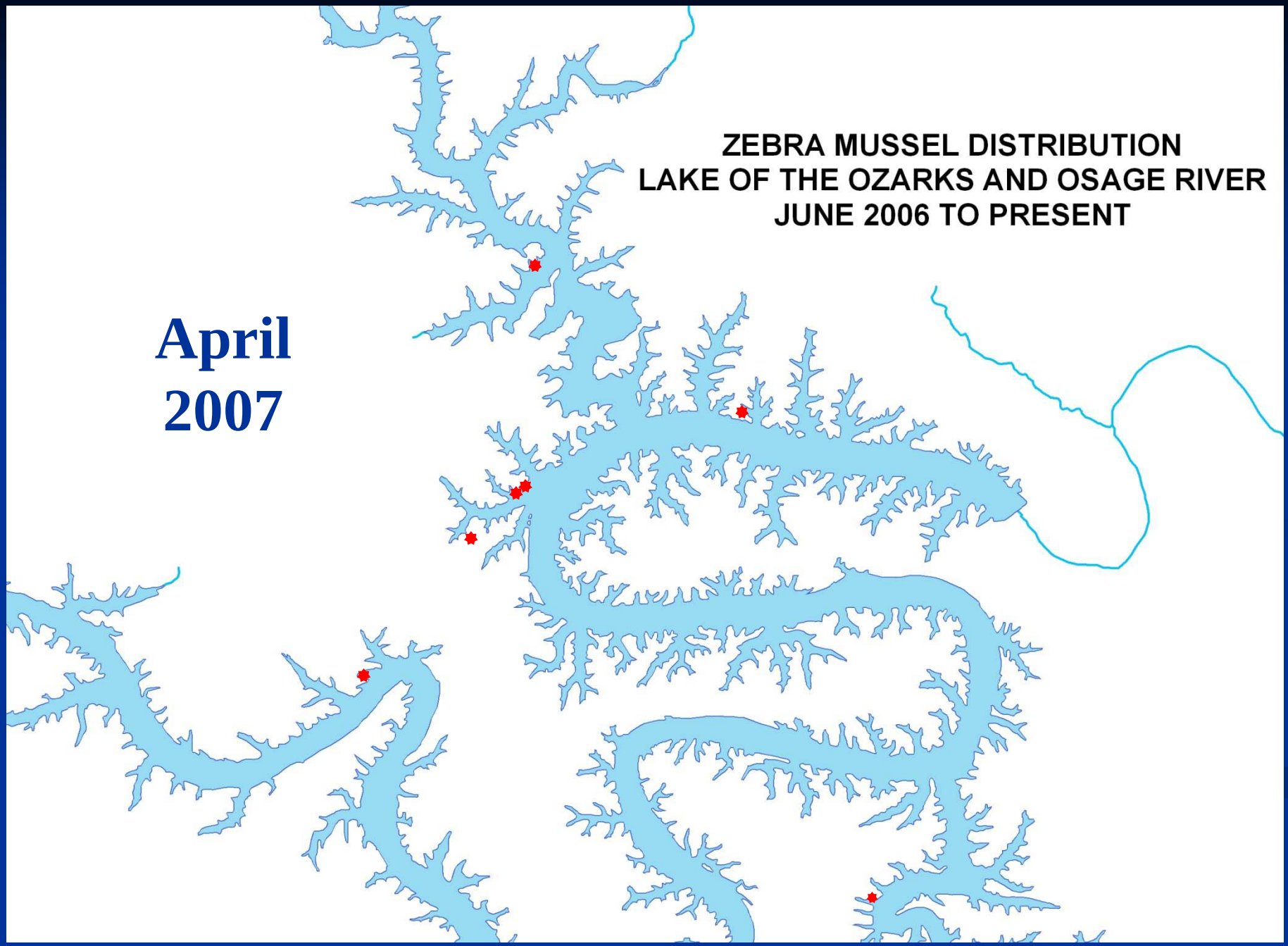

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
June
2006

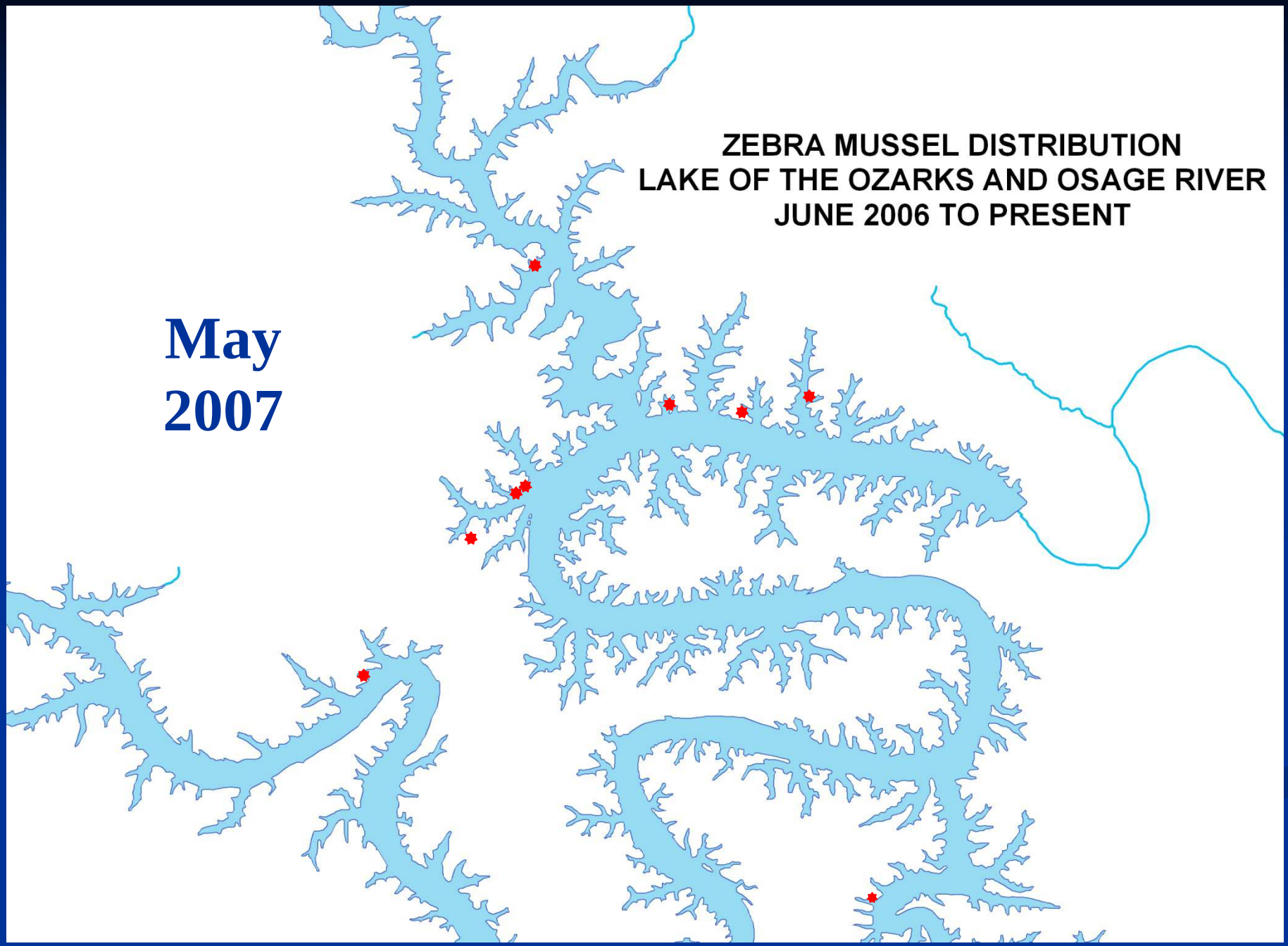

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
August
2006

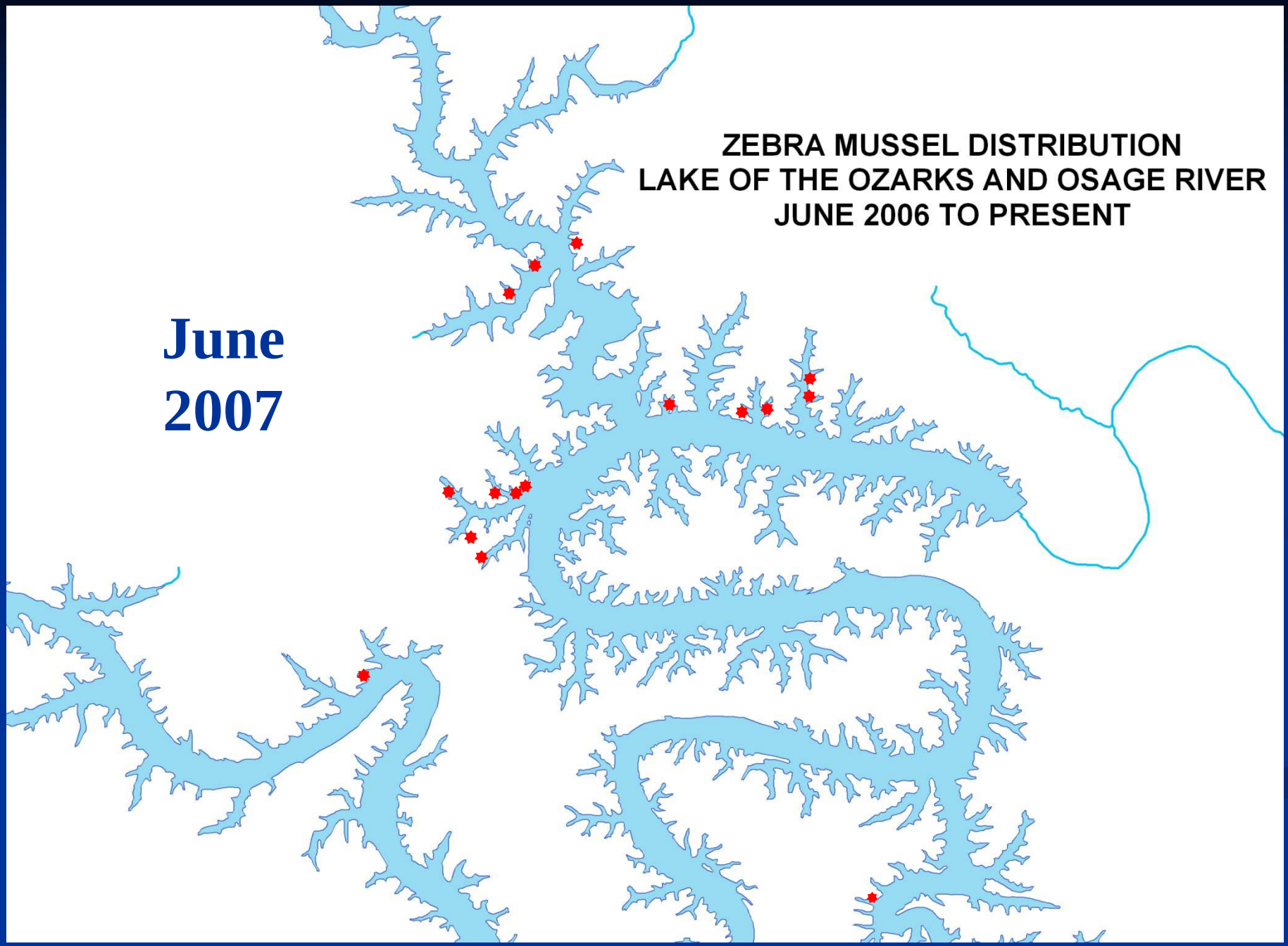

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
September
2006

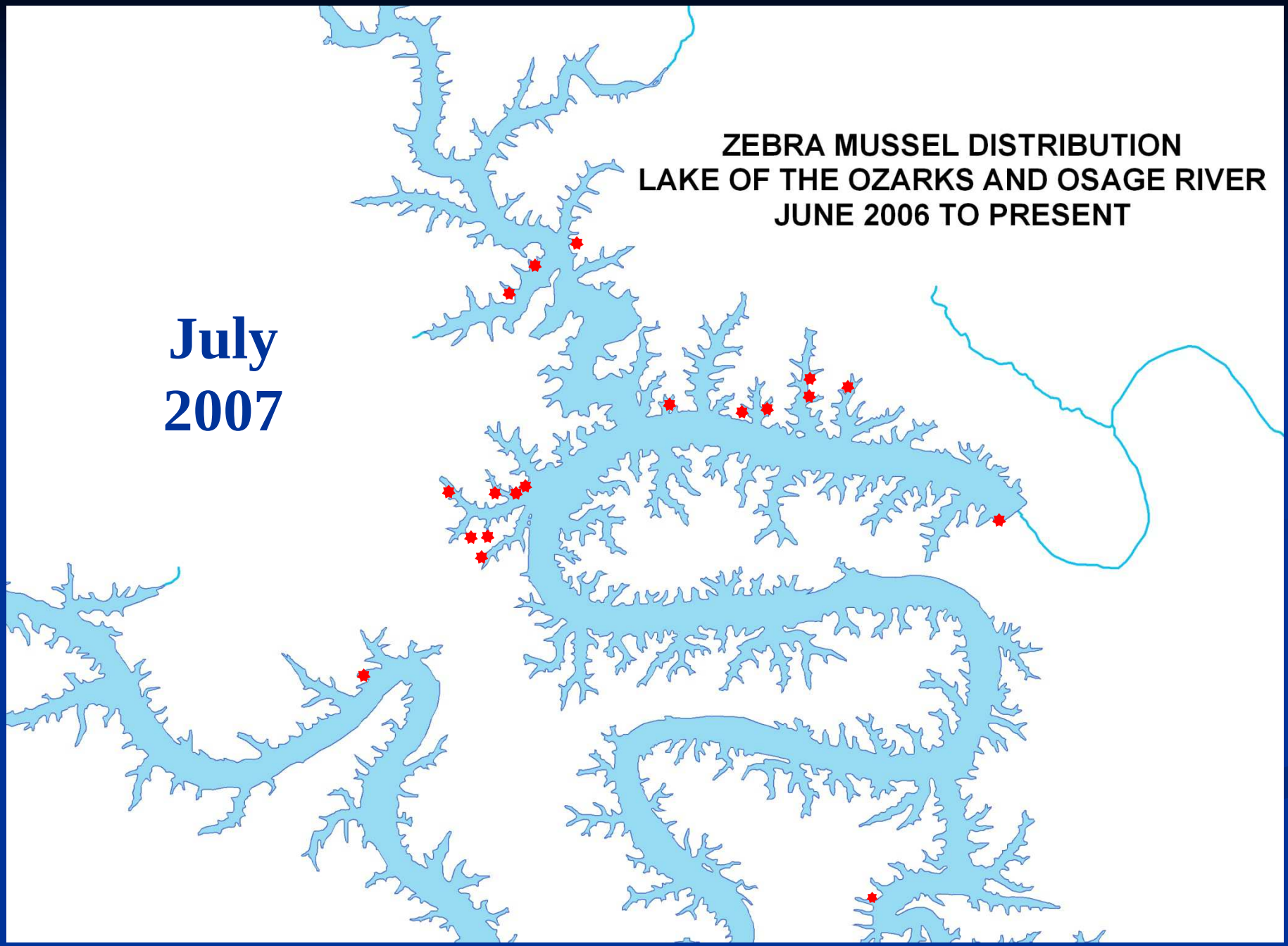

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
October
2006

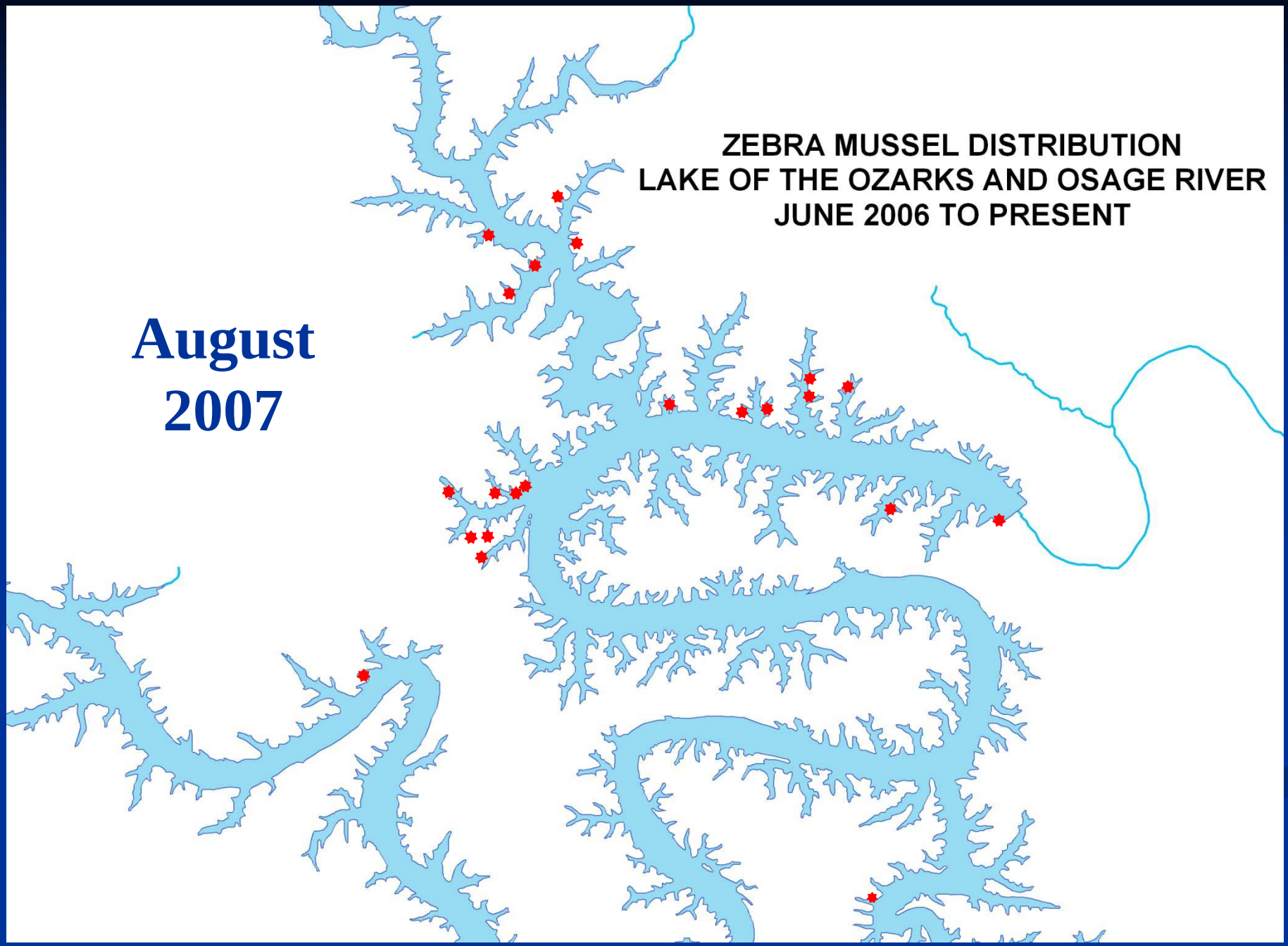

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
March
2007

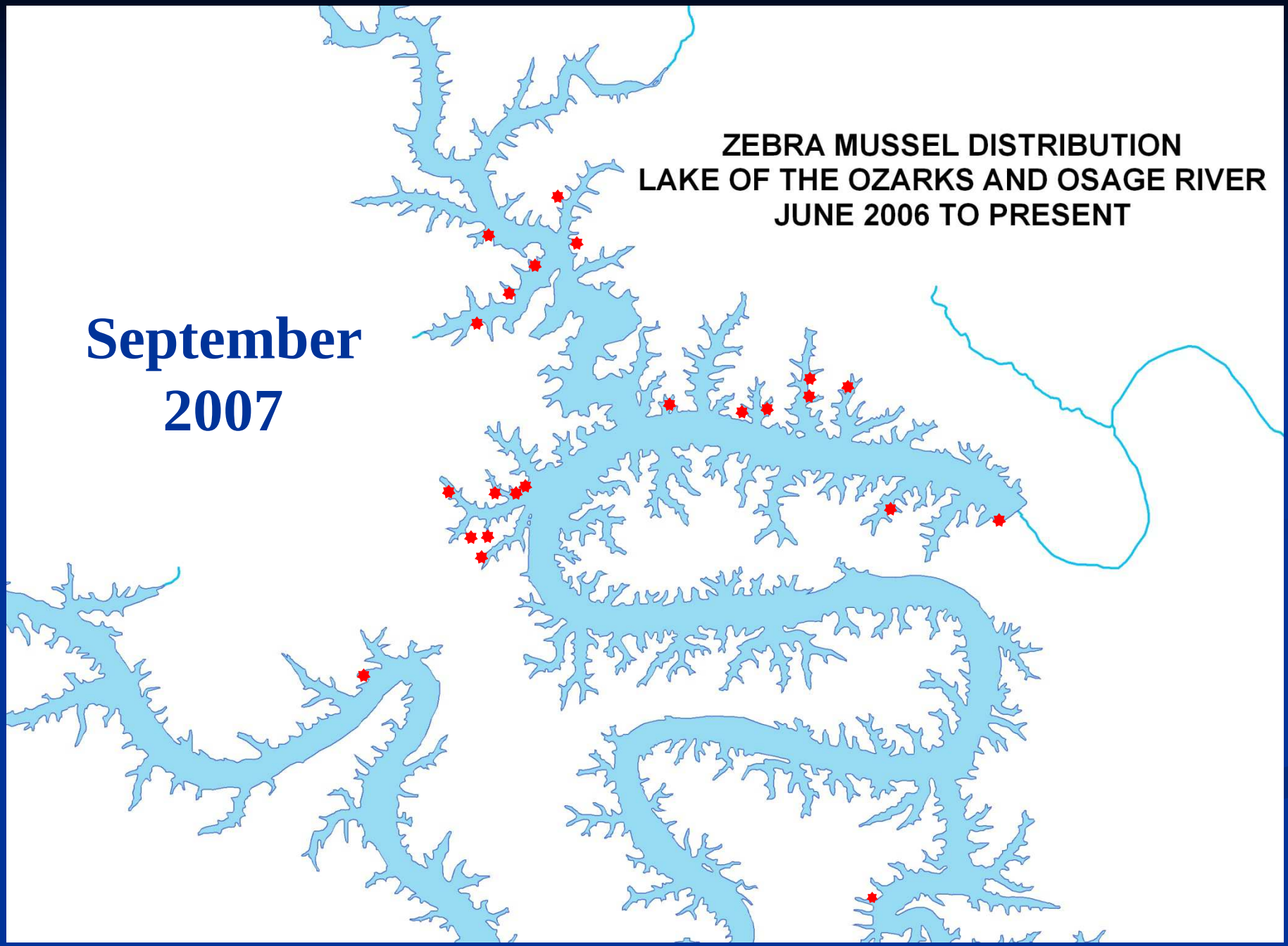

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
April
2007

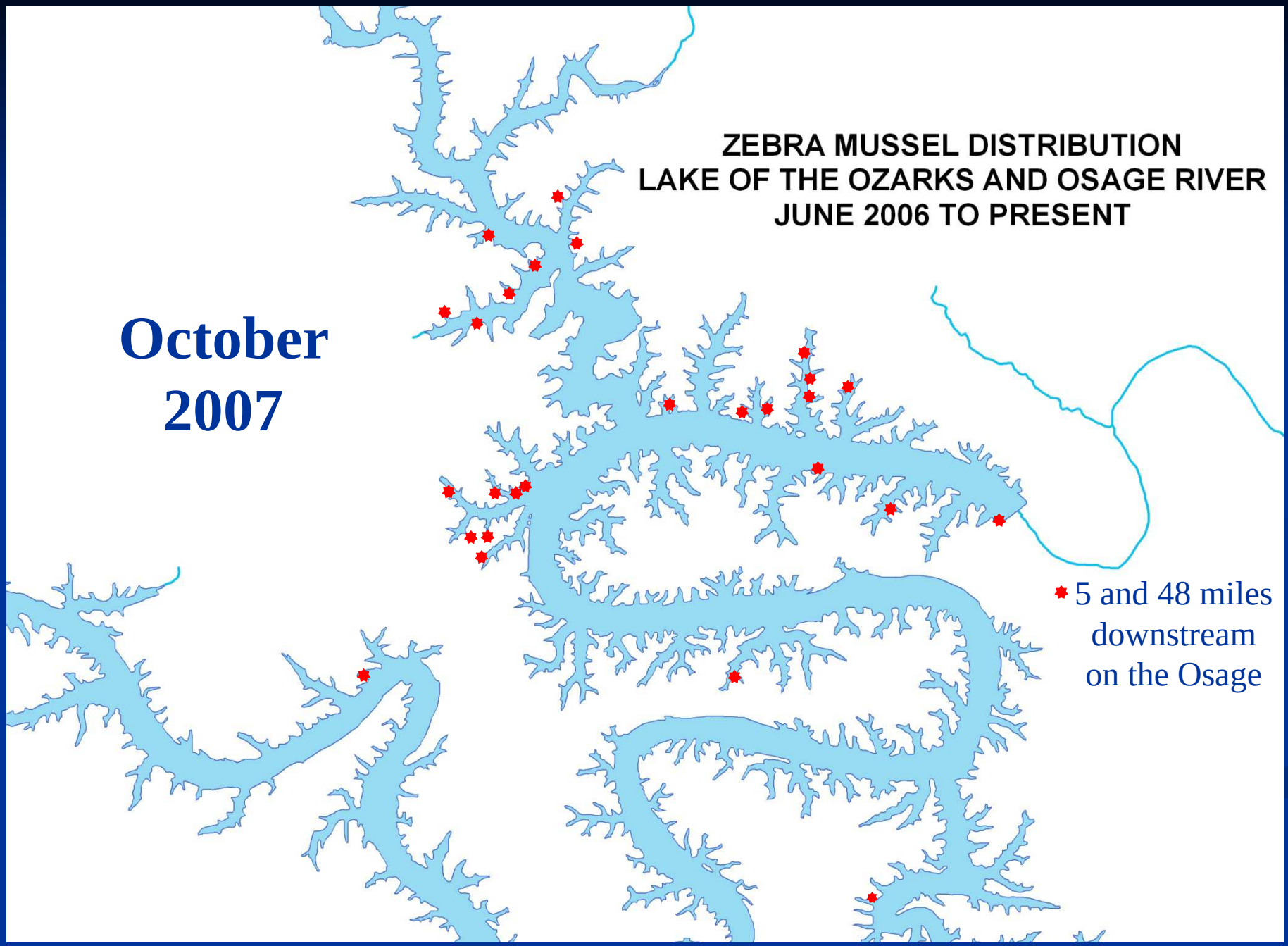

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
May
2007

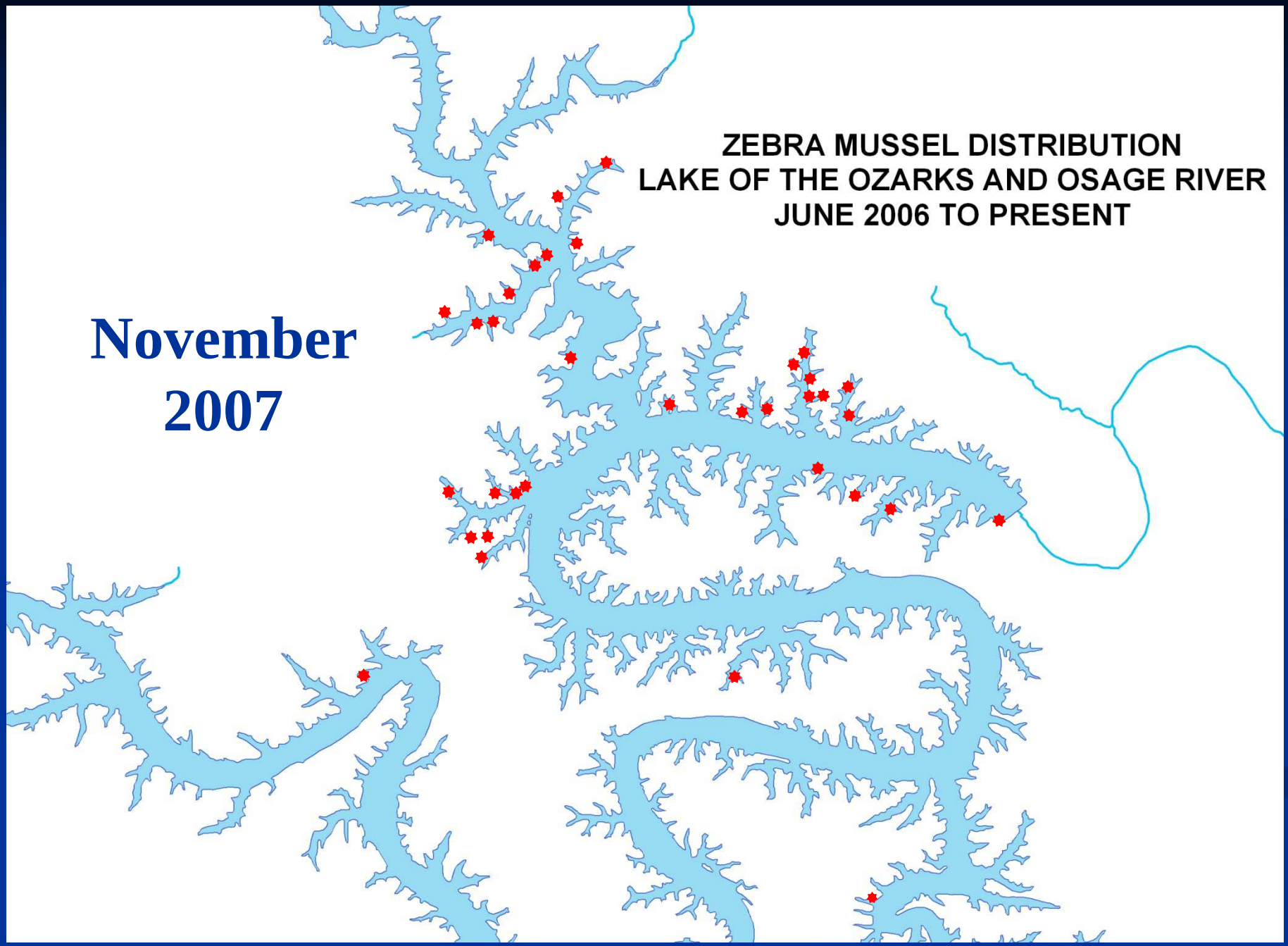

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
June
2007

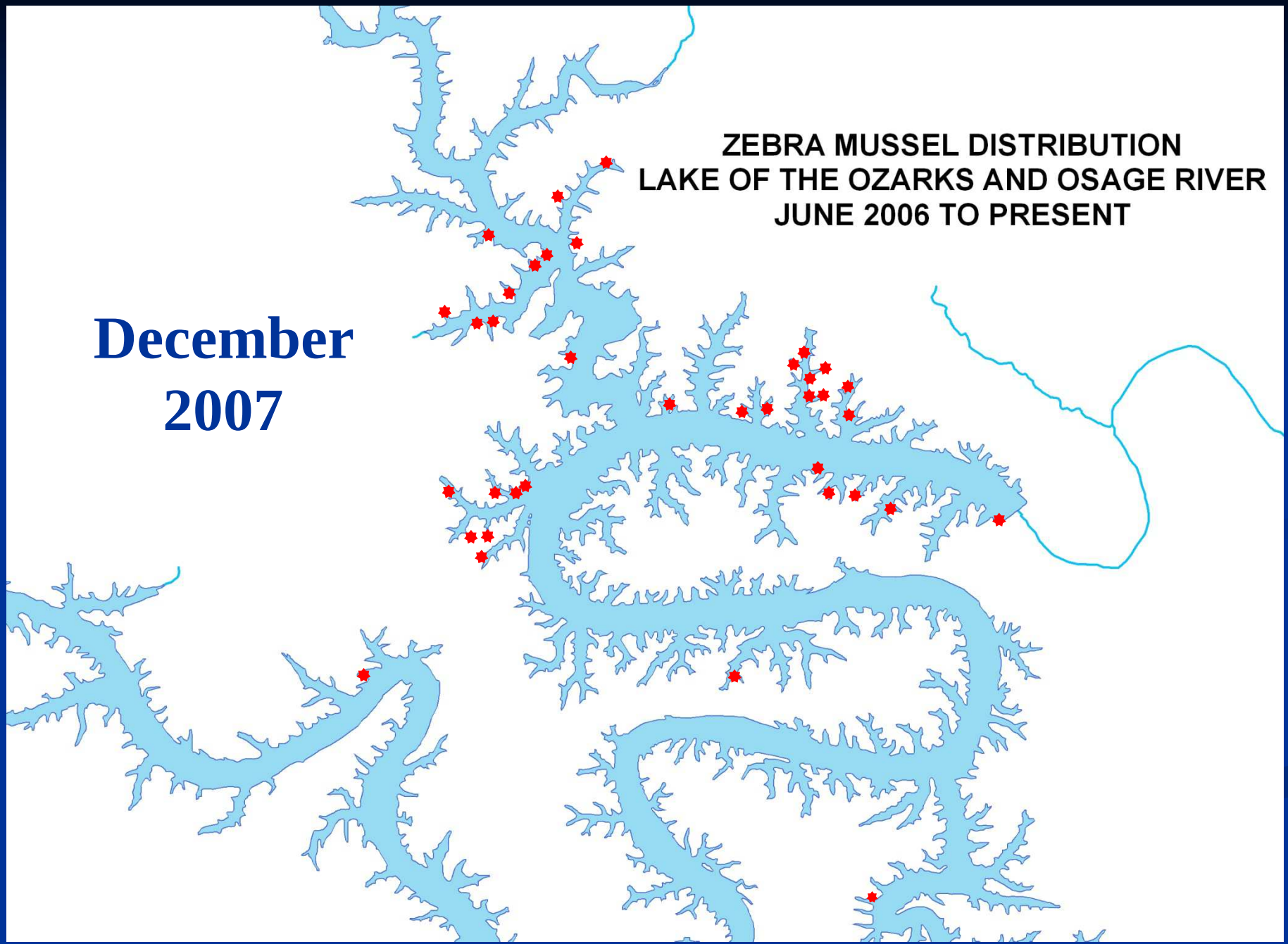

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
July
2007

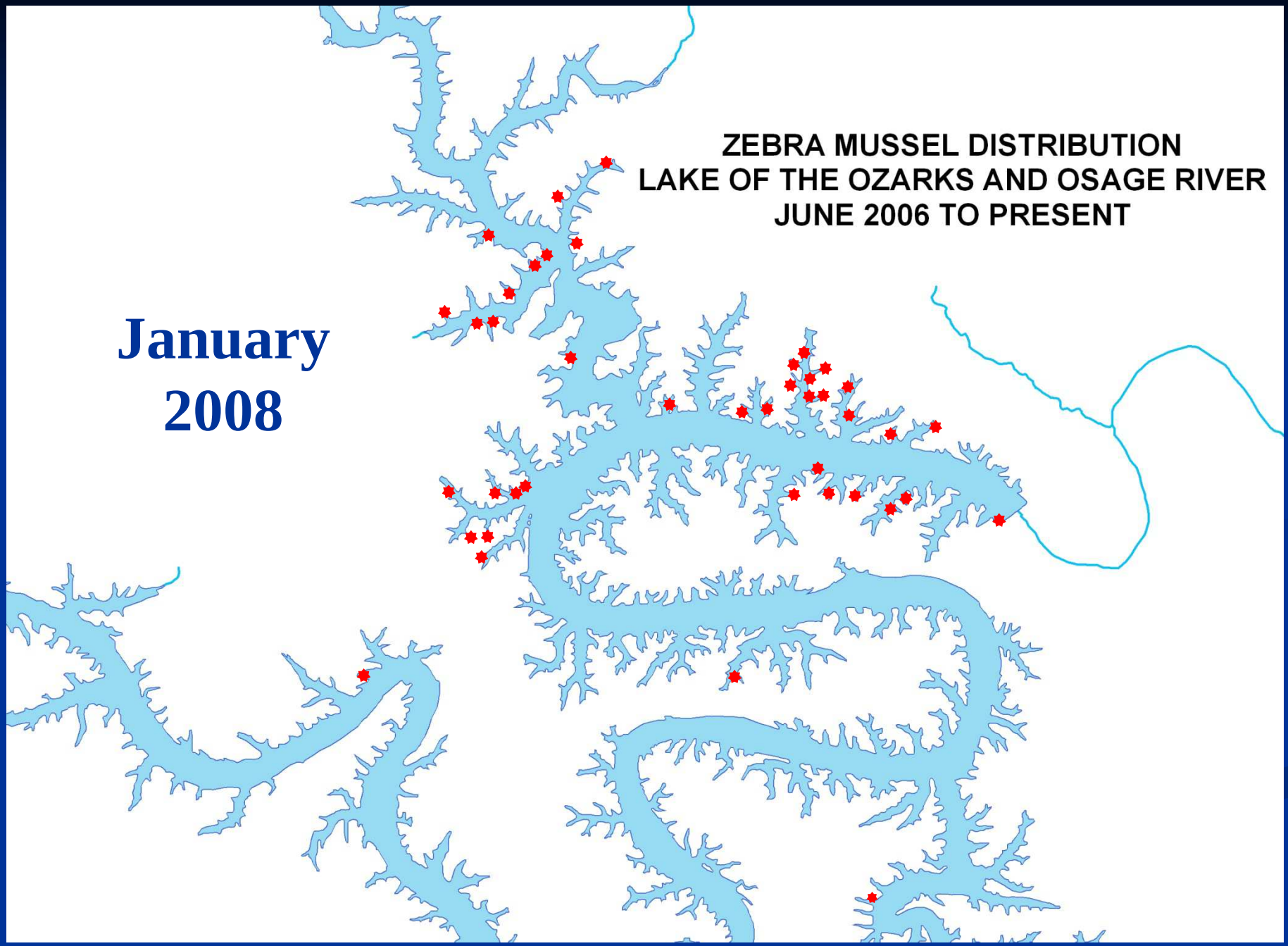

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
August
2007

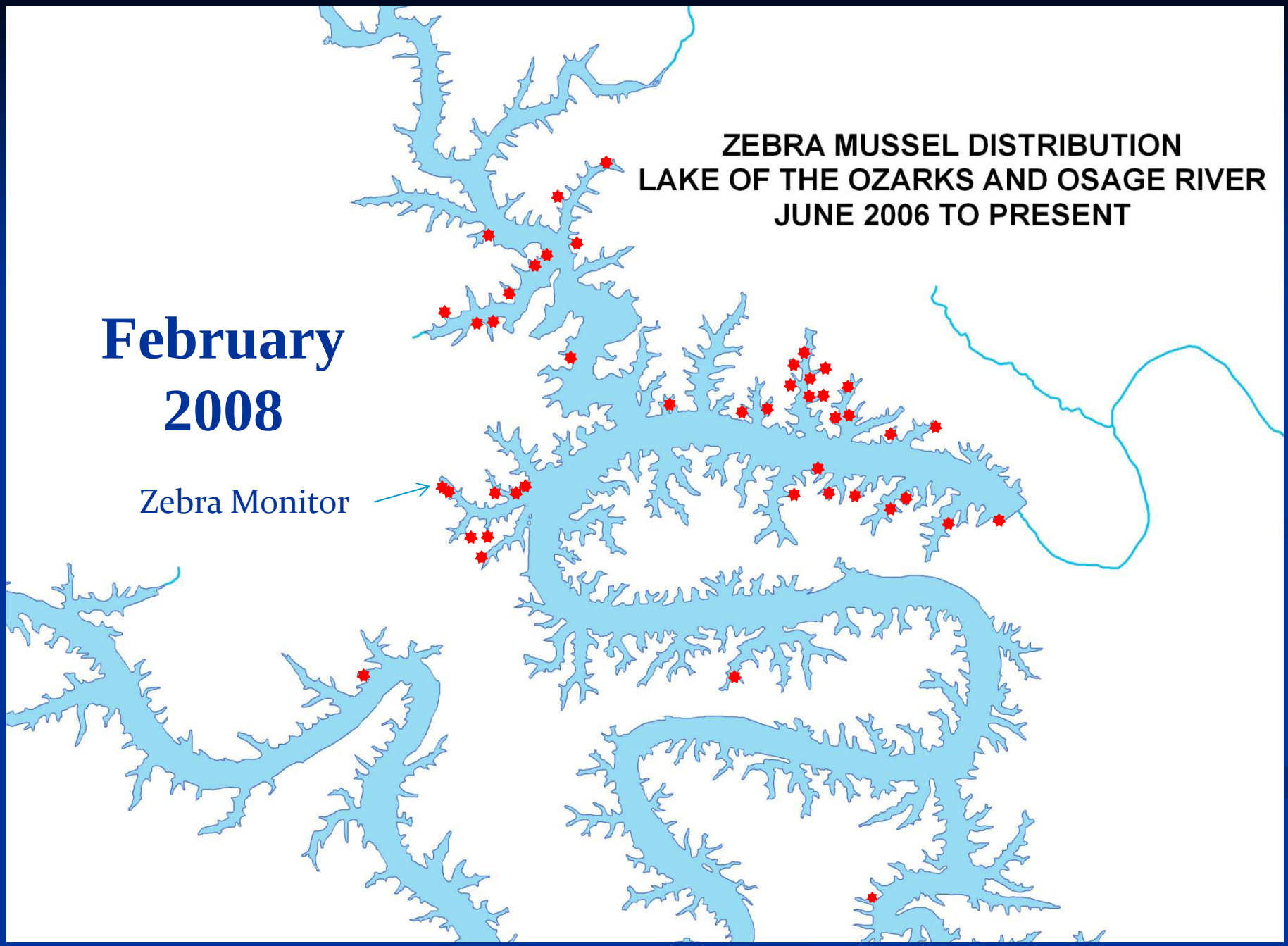

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
September
2007

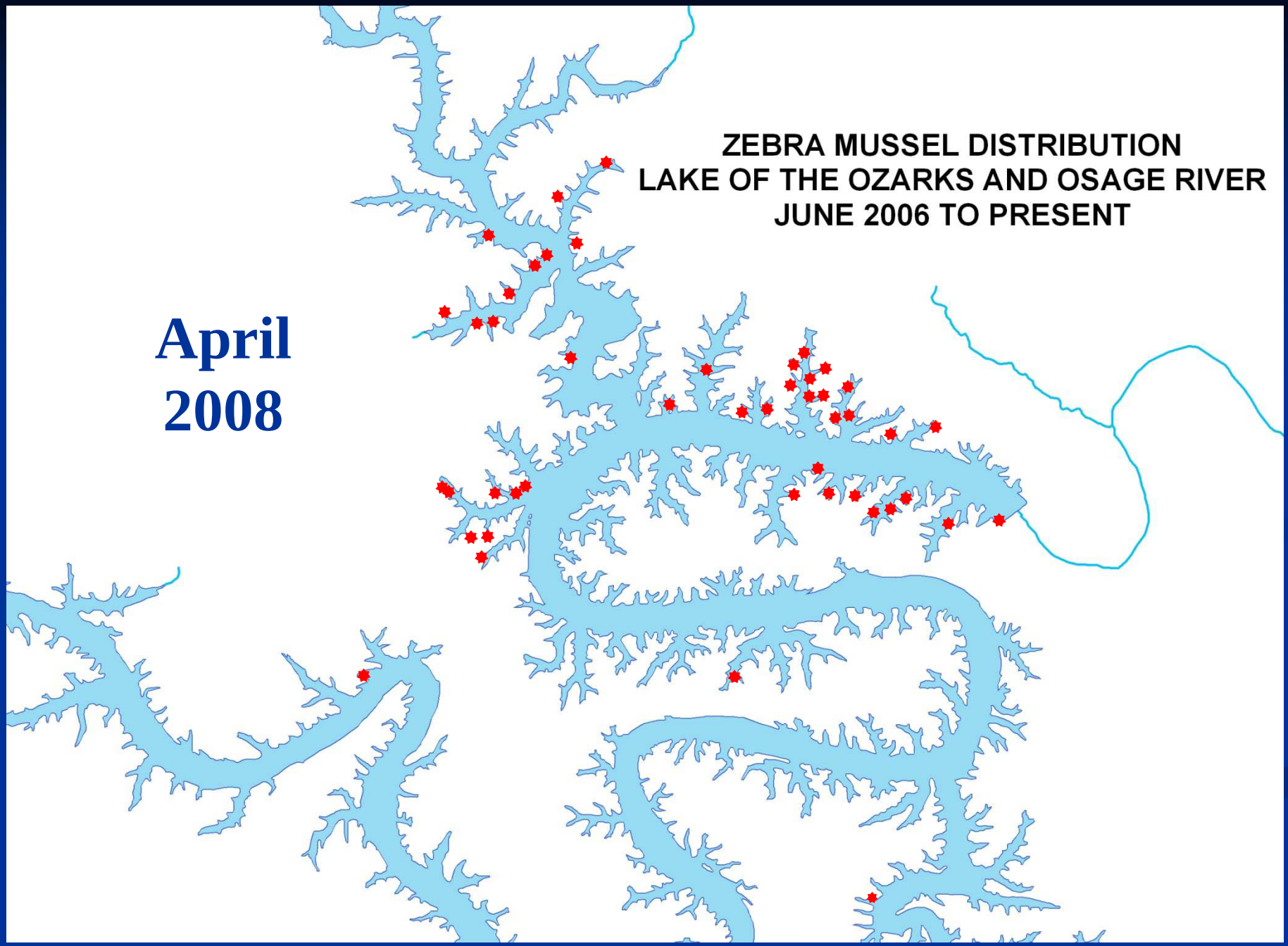

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
October
2007
5 and 48 miles
downstream
on the Osage

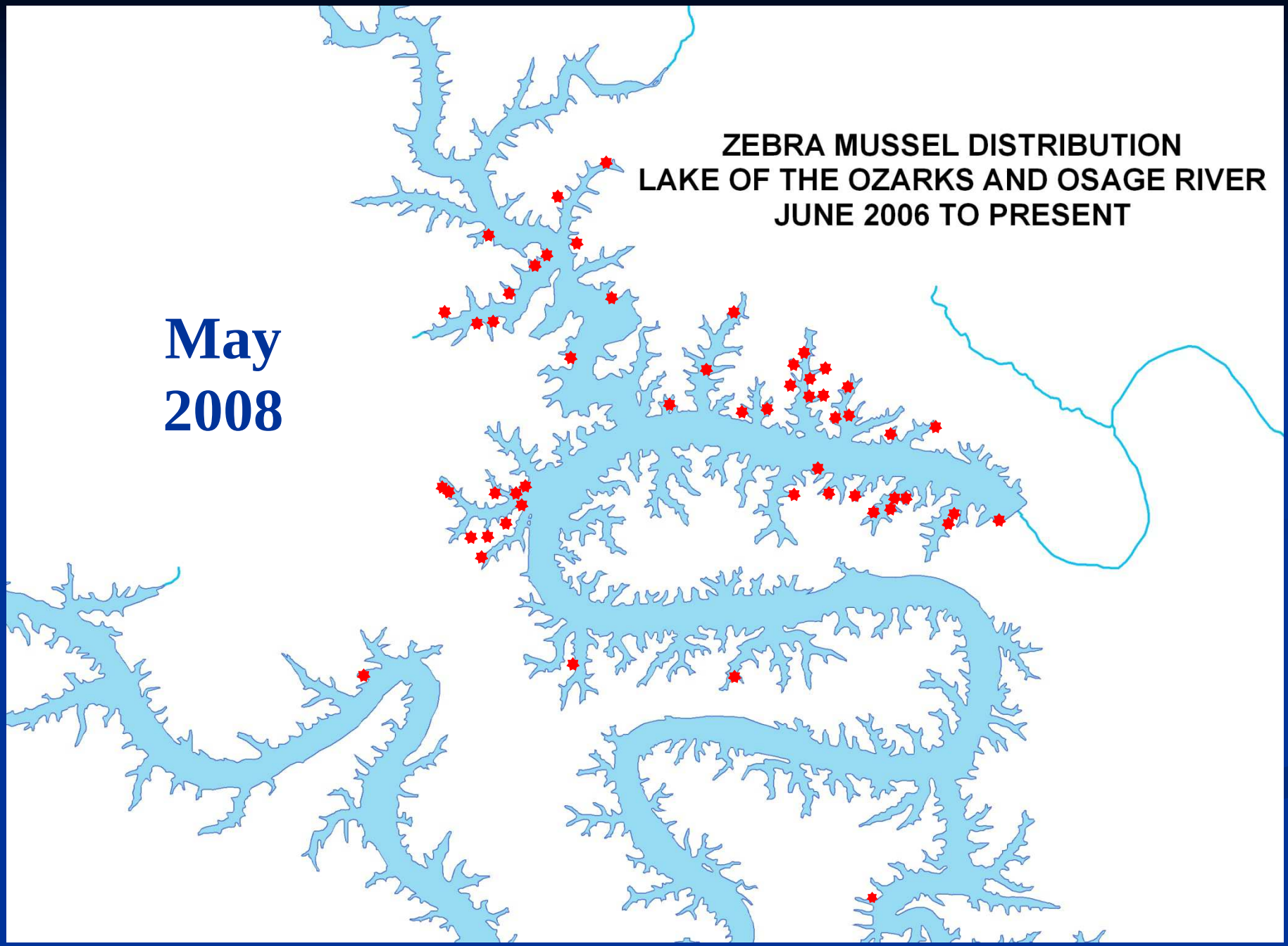

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
November
2007

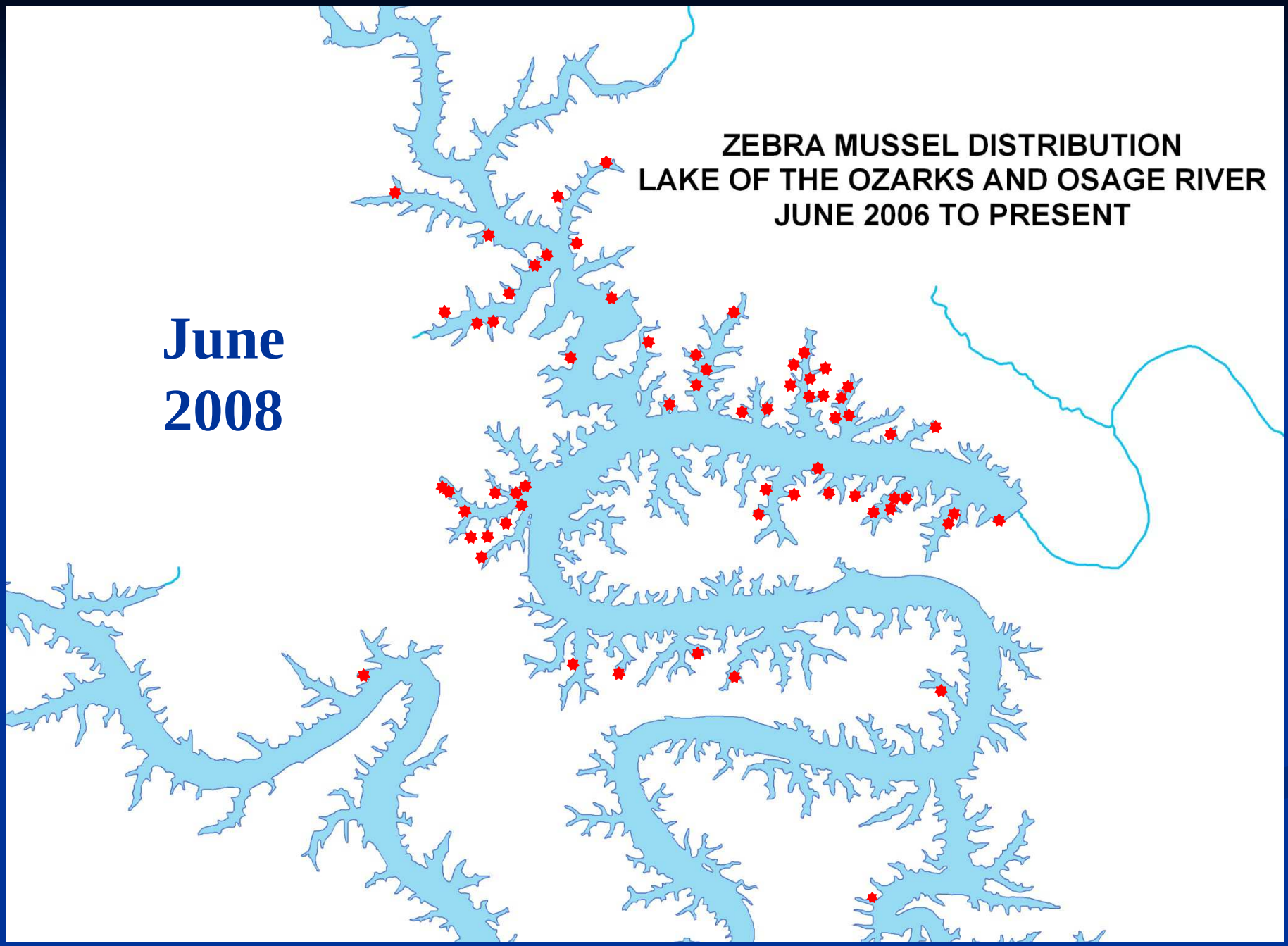

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
December
2007

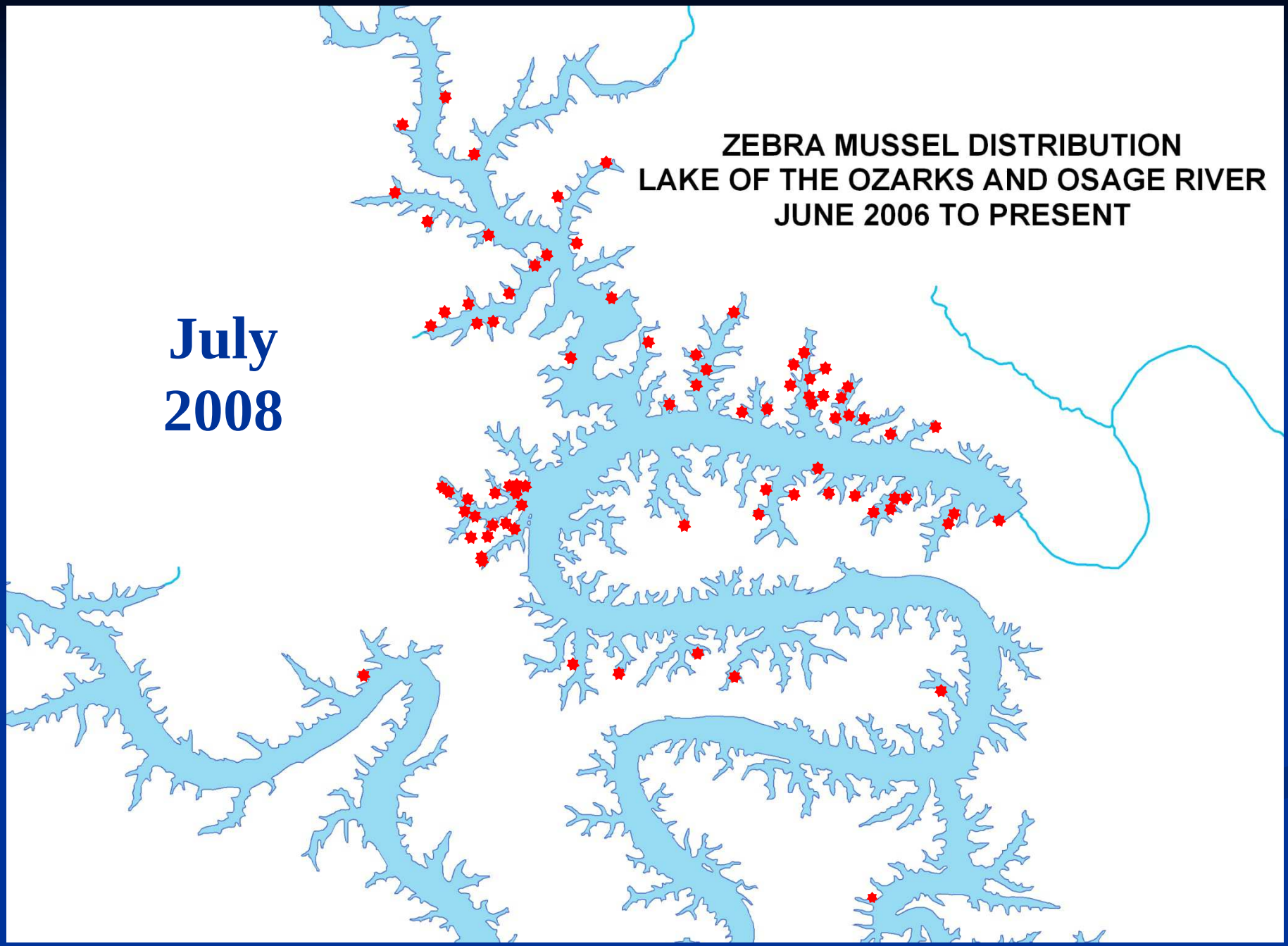

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
January
2008

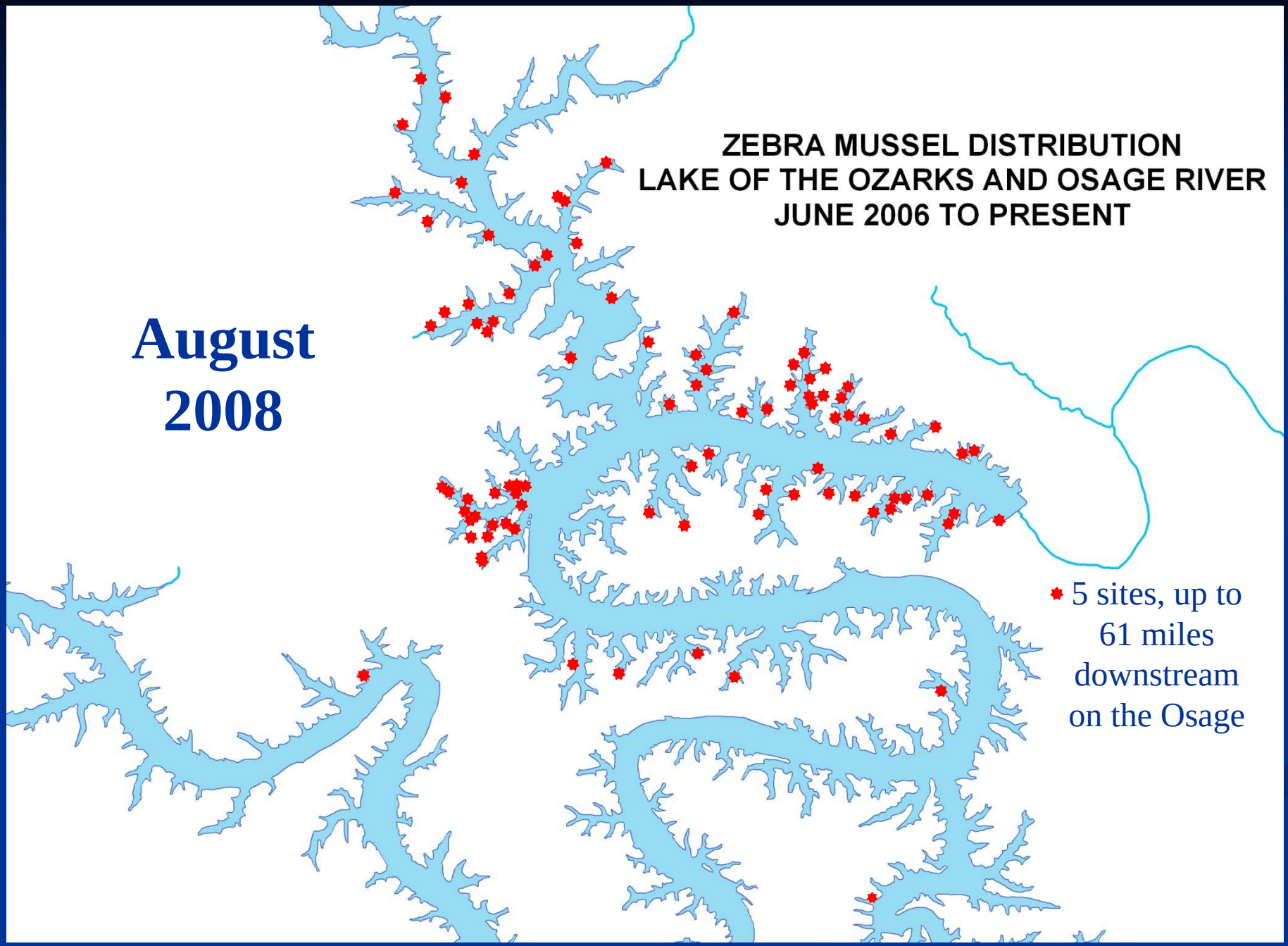

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
February
2008
Zebra Monitor

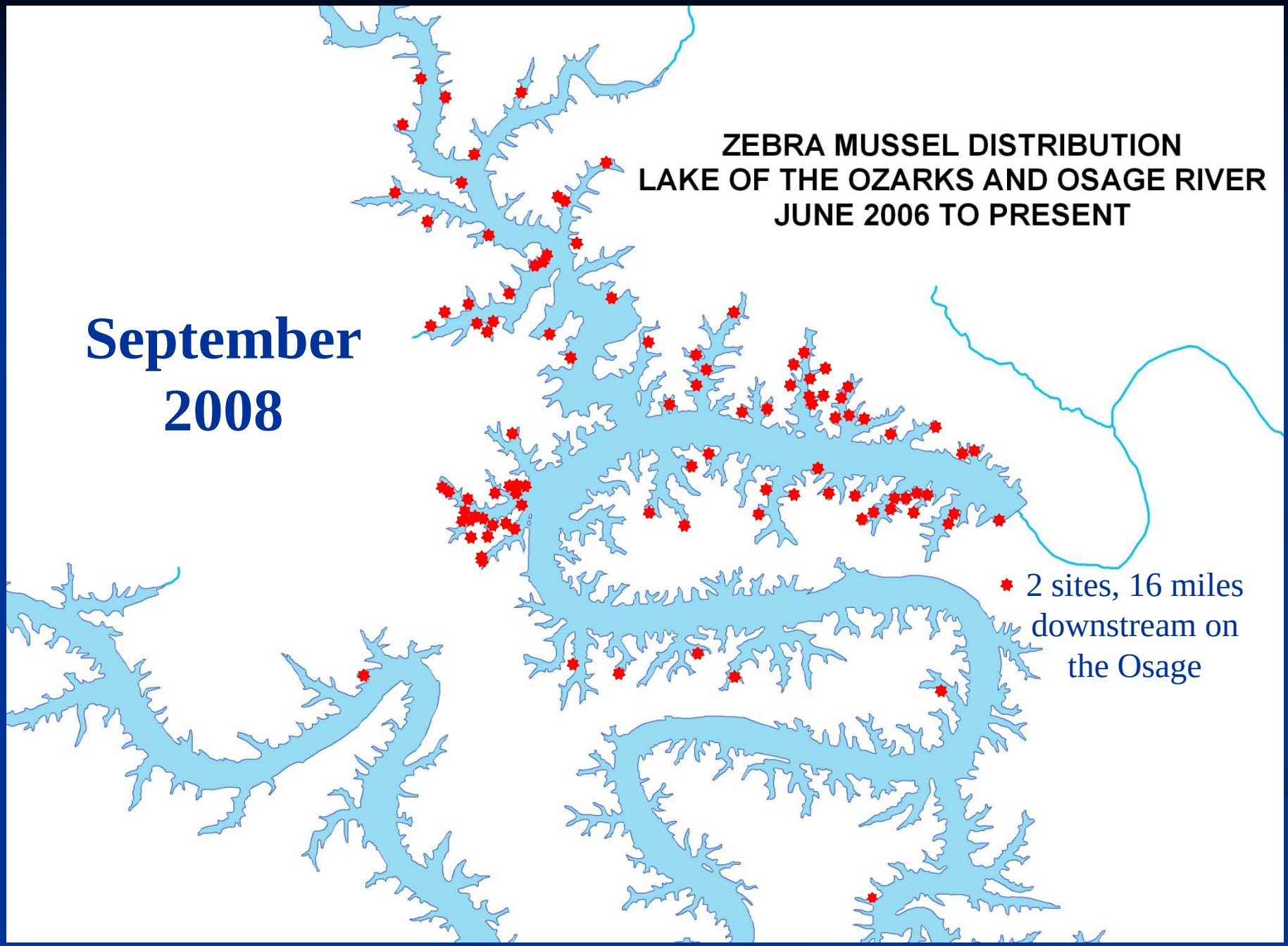

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
April
2008

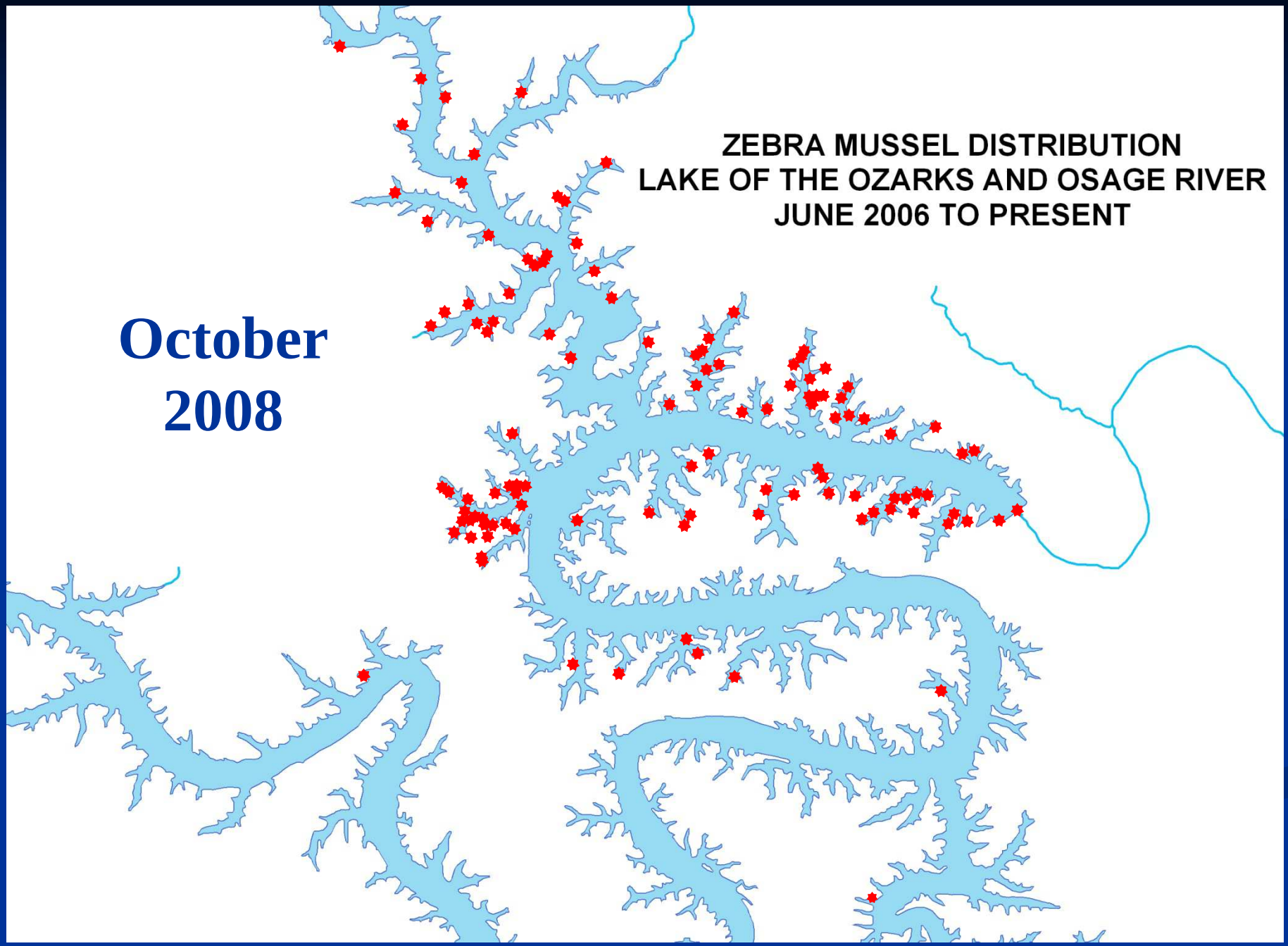

ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
May
2008


ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
June
2008


ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
July
2008


ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
August
2008
5 sites, up to
61 miles
downstream
on the Osage


ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
September
2008
2 sites, 16 miles downstream on the Osage


ZEBRA MUSSEL DISTRIBUTION
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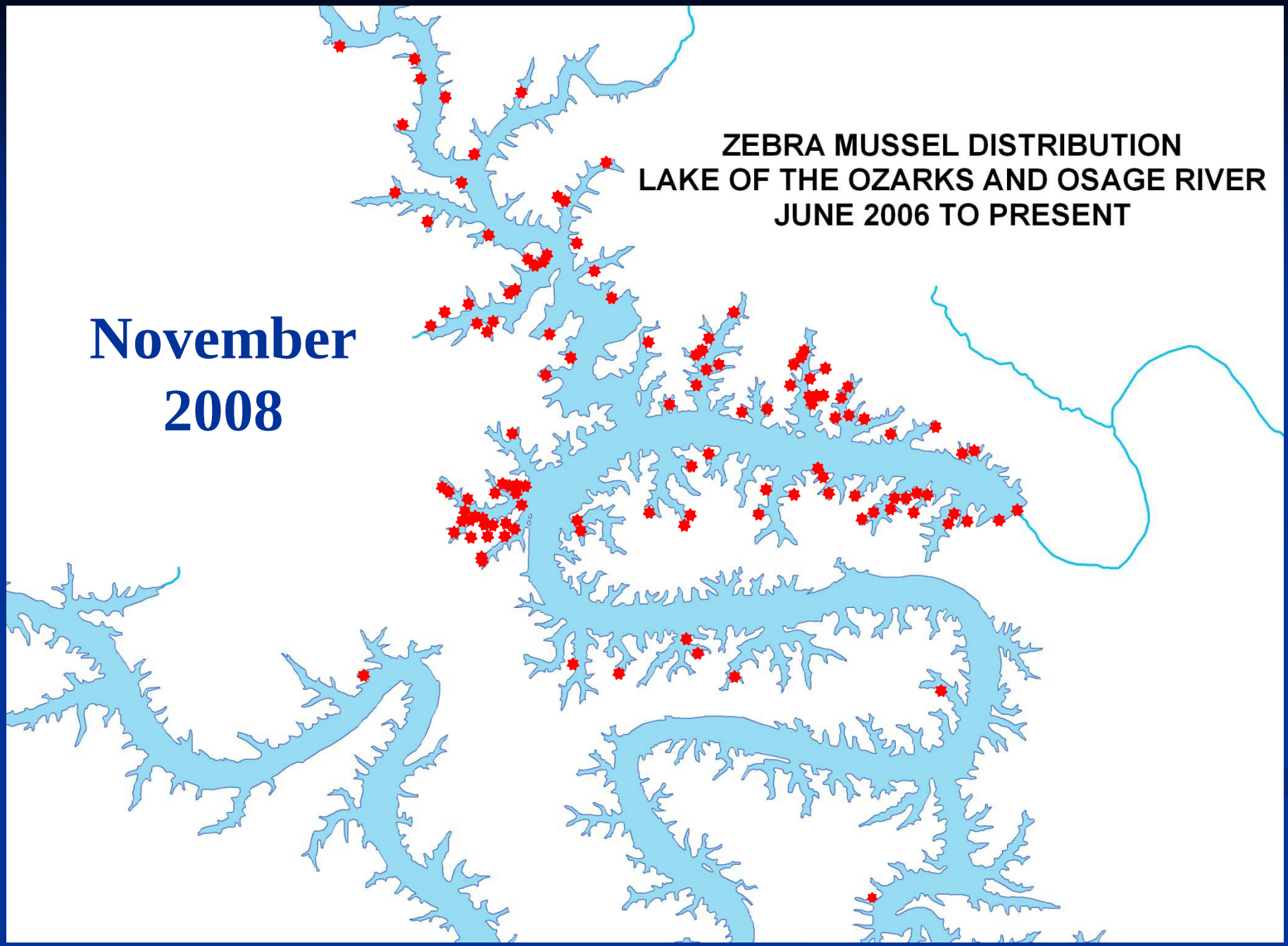
JUNE 2006 TO PRESENT
October
2008


ZEBRA MUSSEL DISTRIBUTION
LAKE OF THE OZARKS AND OSAGE RIVER
JUNE 2006 TO PRESENT
November
2008


5 2:02 PM

Implications

- Effects on diverse, native aquatic assemblages
- Industrial contamination
- Effects on recreation, possibly including fishing
- Infested Missouri lakes & rivers would augment westward expansion

Zebra Mussel Monitoring

- Early detection is the key
- Your eyes – Missouri Stream Teams

Zebra Mussel Monitoring

- Where to look? On any hard surface
  - Under rocks
  - In crevices
  - On woody debris
  - Docks
  - Vegetation
  - In shallow water
  - DO NOT LIKE LIGHT

Zebra Mussel Monitoring

Location?

Information needed from all over the state

- Presence
- Absence

- Popular float streams
- Large reservoirs
- Your monitoring site
- Your adopted stream

WHEN TO LOOK

- Warmer Months → April – October
  - Particularly during drought conditions
- How often to look
  - Monthly is ideal, but every 2-3 months is OK
- Remember to check:
  - Along edges of pools with slow current
  - Everything w/ a hard surface (even native mussels)

CONCRETE BLOCK COLLECTION METHOD

DATA

I FOUND ONE!

- WHO? WHEN? WHERE?

- Data reporting:
  - Voicemail: 800/781-1989
  - E-mail: streamteam@mdc.mo.gov
  - Fax: 573/526-0990
  - Online forms: http//www.mostreamteam.org

Remember, early detection can help slow the spread of zebra mussels!

ANS PREVENTION

Technique	Duration	Concen-tration	Solution (per gallon)	Comments
Vinegar	20 min	100%	1 gallon of vinegar, no water	Safety glasses and gloves should be worn. Vinegar and bleach are corrosive to metal and toxic to fish.
Chlorine	10 min	200 ppm	5 oz or 15 ml of bleach and 1 gallon of water	Before re-use rinse with water but don't let the solution runoff directly to the stream.
Air Drying	3-5 days	N/A	N/A	Equipment must dry completely.
Freezing < 32°F	24 hours	N/A	N/A	Must be below freezing for duration of contact time.
Salt Bath	24 hours	1%	1/8 cup and 1 gallon of water	Equipment must be completely submerged.

ANS Currently in MO

- Zebra Mussel
- Asian Clam
- Chinese Mystery Snail
- Grass Carp
- Common Carp
- Bighead Carp
- Silver Carp
- White Perch

Asian Clam

Chinese Mystery Snail

ANS Currently in MO

- Zebra Mussel
- Asian Clam
- Chinese Mystery Snail
- Grass Carp
- Common Carp
- Bighead Carp
- Silver Carp
- White Perch

Grass Carp

Texas Parks & Wildlife

Bighead Carp

USGS photo

Silver Carp

USGS photo

Help Prevent the Spread of ANS in Missouri

- Other invasive species that could potentially severely impact aquatic resources:
  - *Didymosphenia geminata* or "Rock Snot"
  - New Zealand Mud Snail
  - Faucet Snail
  - Rusty Crayfish
  - Northern Snakehead
  - Black Carp
  - Round Goby
  - Quagga mussel

New Zealand Mud Snail

IT IS ILLEGAL TO DUMP ANIMALS NOT OBTAINED FROM THESE WATERS

Help prevent the spread of these harmful plants and animals!

Rusty Crayfish

Zebra Mussel

Chinese Mystery Snail

African Clawed Frog

Goldfish

Water Hyacinth

Purple Loosestrife

Eurasian Watermilfoil

BAIT: Non-native fish and crayfish may compete with native animals if released.

AQUARIUMS: Fish and snails obtained from pet stores may compete with native animals. Aquarium water may contain microscopic organisms or diseases that are harmful to native species.

PLANTS: Aquatic or terrestrial ornamental plants often thrive once released, out competing native plants and causing environmental and economic harm.

DISPOSAL OPTIONS

ANIMALS: At home, freeze for 24 hours and put in the trash. At a lake, place in a plastic bag and put in the trash.

PLANTS: Place in a plastic bag and put in the trash. DO NOT COMPOST!

WATER: Pour down a drain that leads to a water treatment facility.

For more information, call **573-751-4115** or contact your local Missouri Department of Conservation office at www.mdc.mo.gov/contact-us.

CONSERVATION DEPARTMENT
MISSOURI
Serving nature and you™

Check, Clean, and Dry

- Effective March 1, 2012: all porous-soled waders are banned in MO trout streams to prevent Didymo from entering Missouri
- For more info on Didymo: http://mdc.mo.gov/fishing/protect-missouris-fishing/dont-spread-didymo

Didymo
AKA: Rock Snot

You Can Help Prevent the Spread of Aquatic Invasive Species

- Check, Clean and Dry fishing, boating, and monitoring gear
- Properly dispose of fishing bait
- Inform/educate others about ANS
- Report Invasive Species sightings to the Invasive Species Coordinator at

  573-751-4115.